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Rainbow Bridge National Monument

General Management Plan
Development Concept Plan
Resource Management Plan
Interpretive Prospectus
and Environmental Assessment

July 1990

GENERAL MANAGEMENT PLAN
DEVELOPMENT CONCEPT PLAN
RESOURCE MANAGEMENT PLAN
INTERPRETIVE PROSPECTUS
and
ENVIRONMENTAL ASSESSMENT
for
RAINBOW BRIDGE NATIONAL MONUMENT

January 1990

Rocky Mountain Region
National Park Service
U.S. Department of the Interior

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U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
ENVIRONMENTAL ASSESSMENT

Rainbow Bridge General Management Plan
Development Concept Plan
Resource Management Plan
Interpretive Prospectus
and
Environmental Assessment

SUMMARY OF THE PROPOSED PLAN AND ALTERNATIVES

This General Management Plan provides the National Park Service with direction for long-range management, development, and use of the Rainbow Bridge National Monument. The plan responds to issues identified during the planning process dealing with quality visitor experience, protection of natural and cultural resources, access, interpretive services, and facilities. Three alternatives besides the no-action alternative were considered in detail. Under the no-action alternative, existing facilities would be retained. The proposal and two alternatives focus on improvements to the monument, which respond to the planning issues.

The proposal provides a two-phase approach for both the short- and long-term management of Rainbow Bridge. In the short term and first phase, a seasonal contact station would be constructed at a location within Forbidding Canyon, an entrance fee would be charged at the contact station, NPS interpreters would be provided on concession tour boats, and improvements would be made to the monument for the protection of resources. The entrance contact station would give park management the ability to limit use to coincide with the monument's carrying capacity and protect park resources. It has been determined that the national monument has a visitor capacity of 390 persons at one time. This capacity will be allocated equally between tour boats and private craft in the proposal and alternatives. In the long term, visitor use demands may increase substantially, hindering National Park Service efforts to control human-related impacts. As a result, Phase II includes provisions for a seasonal shuttle transportation system to be used in the future, if park management determines it is necessary to protect resources at Rainbow Bridge. Should the proposal be implemented, expansion of the contact station dock into a transfer dock for the shuttle system, the purchase of six shuttle boats, and the addition of housing at Dangling Rope would be necessary.

Alternative A provides for minimum changes in monument operations and facilities necessary to address major resource protection issues, but does not address safety in

Forbidding Canyon. It provides a least-cost scenario and retains least development, but fails to control large numbers of visitors in a narrow canyon. Within the water access channel leading to Rainbow Bridge National Monument, Alternative A would provide some control over boating by establishment of a wakeless zone, but would not regulate the number of boats allowed in Forbidding and Bridge Canyons at any one time. The number of people at the monument would be limited to the existing monument dock capacity for boats.

Alternative B removes boating noise from the monument by extending the monument dock and relies on interpretive services to help reduce use-related impacts. It provides some control over private boats by establishing a contact station within Forbidding Canyon. Because of the length of the walkway, it has the highest monument carrying capacity. Consequently the monument, under this alternative, could accommodate the most visitors at one time. It would not, however, solve many of the recurring problems associated with Rainbow Bridge.

The environmental consequences of the proposed action and other alternatives are fully disclosed within this document. Consequences of implementing the proposal include temporary effects of construction of a low-impact trail system on soil and water; increased safety to visitors from the effects of rockfall, flash floods, and crowded boating conditions; reduction of noise at the monument; and an improved visitor experience through the scheduled use of the monument. This General Management Plan contains four appendix documents - (A) Carrying Capacity, (B) Interpretive Prospectus, (C) Resource Management Plan, and (D) Flash Flood Mitigation Plan. The document is intended to provide for all of the planning needs of Rainbow Bridge National Monument.

Address Comments To:

Superintendent
Glen Canyon National Recreation Area
P.O. Box 1507
Page, Arizona 86040

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PURPOSE AND NEED FOR THE PLAN

INTRODUCTION

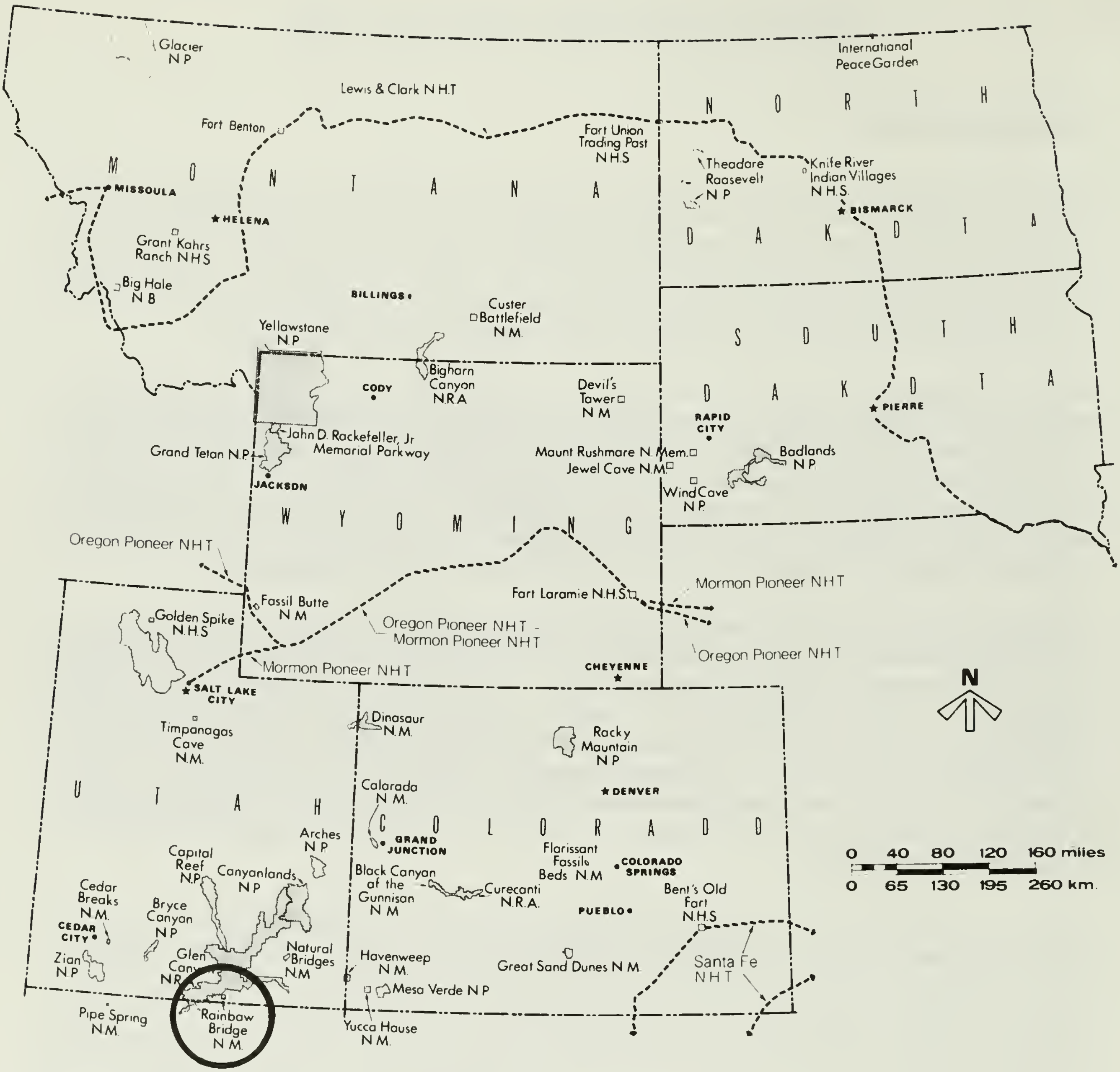
Rainbow Bridge is located in the heart of some of the Nation's most rugged canyon country. It is bounded on three sides by the Navajo Reservation (Navajo Mountain Chapter) and lies in the Third Congressional District of Utah. A thin finger of Lake Powell extends to the monument boundary in its northwest corner, forming a common boundary between Rainbow Bridge National Monument and Glen Canyon National Recreation Area. The monument's total area is 160 acres. (See Region and Vicinity Maps.)

Rainbow Bridge is in a region of outstanding recreational, scenic, scientific, and historic interest. The adjacent Glen Canyon National Recreation Area features a manmade lake in an otherwise arid environment. Following the course of the Colorado River for almost 200 miles, the recreation area abuts Canyonlands National Park, Capitol Reef National Park, Rainbow Bridge National Monument, and Grand Canyon National Park, with Lake Mead National Recreation Area farther downstream. This immediate area constitutes a significant part of the outstanding national parklands in the general region.

The purpose of this environmental assessment is to provide sufficient information and analysis for determining whether to prepare a Finding of No Significant Impact (FONSI) or a Environmental Impact Statement (EIS). If, based on review of the General Management Plan/Development Concept Plan/Interpretive Prospectus/Resource Management Plan/Environmental Assessment (GMP/DCP/IP/RMP/EA) and the results of the public review process, the regional director concludes that the plan will result in significant impacts to the human environment, then the project would include preparation of a draft and final environmental impact statement. If not, a Finding of No Significant Impact will be prepared.

This plan sets forth the basic management philosophy for the Rainbow Bridge National Monument and provides strategies for addressing issues and management objectives. As outlined under NPS-2, this document will include measures for the preservation of the area's resources; indications of the types and general intensities of development (including visitor circulation and transportation patterns, systems and modes) associated with public enjoyment and use of the area, including timing of implementation and anticipated costs; and identification of and implementation of commitments for visitor carrying capacities for all areas of the unit.

The document also discloses the potential environmental consequences that may result from implementation of various alternatives. It documents the process used by the National Park Service (NPS) in preparing a general management plan (GMP), a development concept plan (DCP), a resource management plan (RMP), and an interpretive prospectus (IP) for the monument.



Legend

- Locations of Major Cities

* Locations of State Capitals

State Boundary Lines

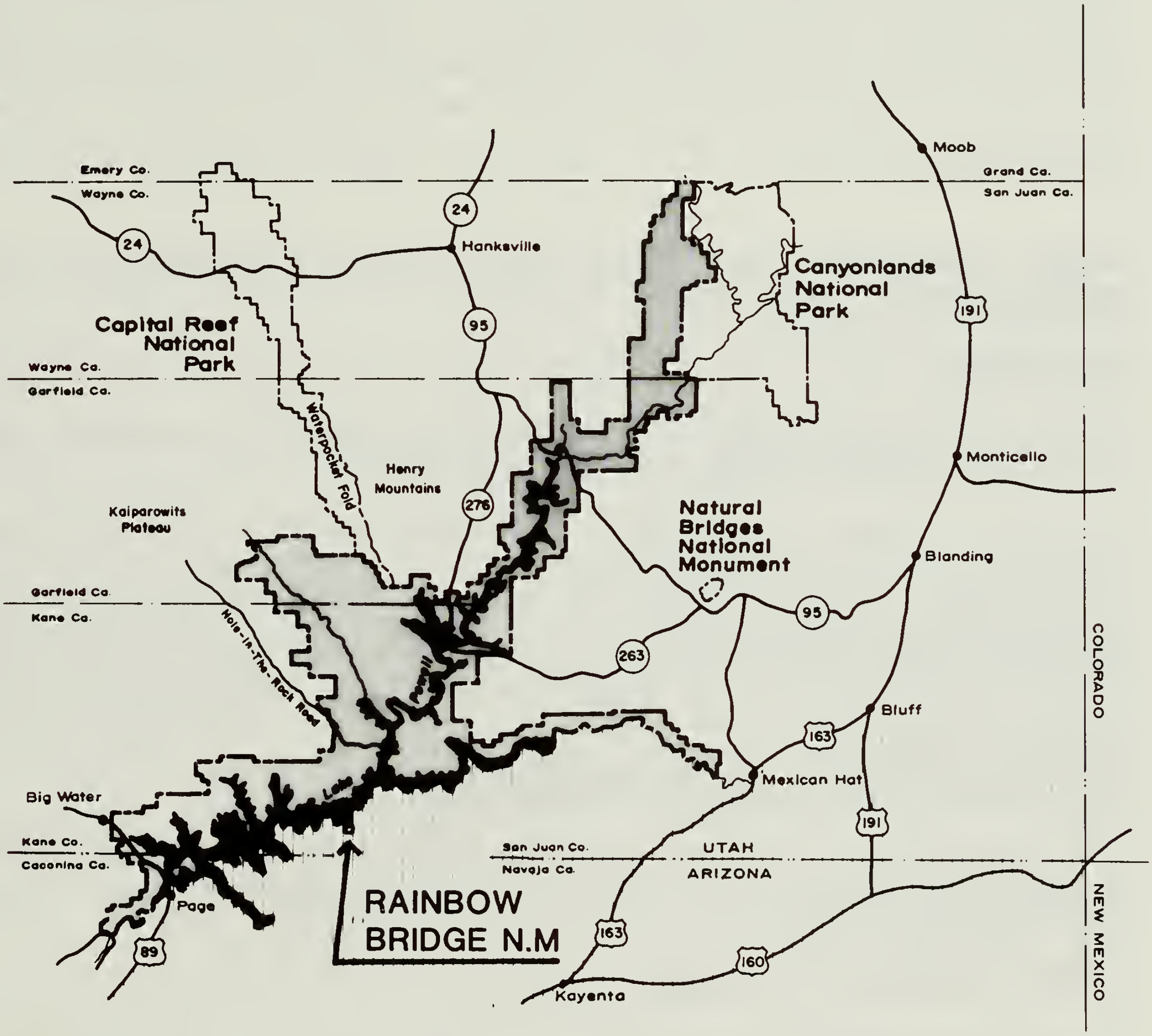
National Park Service Areas

----- National Park Service Historical Trails

ROCKY MOUNTAIN REGION

National Park Service

United States Department of the Interior



LEGEND

▨ Glen Canyon N.R.A.

☐ Navajo Indian Reservation

N

0 10 20 miles

0 15 30 kilometers

VICINITY MAP

RAINBOW BRIDGE NATIONAL MONUMENT

UNITED STATES DEPTARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

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This document is organized into three main chapters: Purpose and Need, The Proposal and Alternatives, The Affected Environment and Environmental Consequences. The Purpose and Need chapter includes legislative information pertinent to the project and issue identification. The Proposal and Alternatives chapter identifies the NPS's preferred alternative (the proposed plan) and alternatives developed to resolve the planning issues. The Affected Environment and Environmental Consequences describes the environment that could be affected by alternatives, and documents the effects of each alternative on the environment.

PARK PURPOSE, PERTINENT LEGISLATION/AUTHORITIES, AND MANAGEMENT OBJECTIVES

Park Purpose

The purpose of the park relates to its uniqueness as the world's largest natural bridge and as an outstanding example of eccentric stream erosion.

The Rainbow Bridge was recognized by President William H. Taft, who issued Presidential Proclamation Number 1043 on May 30, 1910, setting aside a 160-acre tract of land under the authority granted him by Section Two of the 1906 Act for the Preservation of American Antiquities. His proclamation read in part "Whereas, an extraordinary natural bridge, having an arch which is in form and appearance much like a rainbow, and which...is of great scientific interest as an example of eccentric stream erosion, and it appears that the public interest would be promoted by reserving this bridge as a National Monument...I do hereby set aside as the Rainbow Bridge National Monument, one surveyed tract of land, embracing said natural bridge."

The bridge itself has a span of 275 feet, reaches a height of 290 feet, and is 42 feet thick at the top and 33 feet wide at the narrowest point. To many American Indians, Rainbow Bridge is a sacred place.

Pertinent Legislation/Authorities

There are many authorities, memorandums, and pieces of legislation that have had an effect on Rainbow Bridge. Two general areas are important to Rainbow Bridge and have an effect on alternatives for its basic management direction. These are (1) those documents that have had a direct effect on the lands inside the monument boundary and (2) those documents that have had an effect on access and indirectly may affect lands within the monument boundary.

Legislation/Authorities Directly Affecting Lands Inside the Monument Boundary. Those documents that directly affect lands inside the monument boundary are:

Antiquities Act of 1906, entitled "An Act for the Preservation of American Antiquities." Section two of this act gave the authority to the executive branch to establish Rainbow Bridge, by Presidential Proclamation.

The Act of August 25, 1916, 39 Stat. 535; 16 U.S.C. 1, established the National Park Service. This tasked the National Park Service as the managing Agency for Rainbow Bridge with two primary objectives: "...to provide for the enjoyment" of persons visiting parks and monuments and "in such a manner and by such means as will leave them unimpaired for future generations."

Presidential Proclamation Number 1043, of May 1910. This Presidential Proclamation established Rainbow Bridge National Monument.

American Indian Religious Freedom Act of 1978, Public Law 95-431, Stat. 469. This act established that it is the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise their traditional religions and rites, to include access to traditional sites and the use and possession of sacred objects. The National Park Service must assure that its general regulations and basic management on access to, and use of, park lands and park resources, such as Rainbow Bridge National Monument, are applied in a balanced manner that does not unduly interfere with an American Indian group's use of historically traditional places or sacred sites located within the bounds of a park unit.

Title IV of the National Historic Preservation Act Amendments of 1980, Public Law 96-515; 16 U.S.C. 470 a-1, a-2. This outlines the Department of Interior, National Park Service's implementing responsibilities for the U.S. World Heritage nomination process. Rainbow Bridge National Monument was nominated as a World Heritage Site in 1989 (Fed. Reg., Vol. 54. No. 86, May 5, 1989, pp. 19469).

Legislation/Authorities Affecting Access to Rainbow Bridge National Monument and Indirectly Affecting Lands within Rainbow Bridge National Monument. Those documents are:

The Act of August 7, 1946, 60 Stat. 885; 16 U.S.C.17j-2. This act provided appropriations to the National Park Service for: (b) administration, protection, improvement, and maintenance of areas under the jurisdiction of other Agencies of the Government, devoted to recreational use pursuant to cooperative agreements.

Public Law 84-485, 70 Stat. 105, Colorado River Storage Project Act, April 11, 1956, "To authorize the Secretary of the Interior to construct, operate, and maintain the Colorado River Storage Project and participating projects... .". This act authorized the construction of Glen Canyon Dam and eventually changed the way Rainbow Bridge National Monument was accessed by the public from primarily land to water. Section 8 of this law directed the Secretary of Interior "...to investigate, plan, construct, operate and maintain public recreational facilities on lands withdrawn or acquired for the development of said project or of said participating projects, to conserve the scenery, the natural, historic, and archaeologic objects, and the wildlife on said lands, and to provide for public use and enjoyment of the same and of the water areas created by these projects by such means as are consistent with the primary purposes of the projects."

Memorandum of Agreement between the Bureau of Reclamation and the National Park Service, September 24, 1956. Under the above authority, the Secretary of the Interior established Glen Canyon Recreation Area in 1958 and designated the National Park Service the administering Agency.

Public Law 85-868, 72 Stat. 1686, "To provide for the exchange of lands between the United States and the Navajo Tribe...," dated September 2, 1958. Sec. 2 (a) describes parcels "A" and "B" lands. Along that portion of Lake Powell extending from the Page townsite eastward along the Colorado and San Juan Arm, lands below the 3,720-foot contour were acquired by the Federal Government. In relinquishing these lands (known as Parcel "B" lands), the tribe retained the mineral rights. The legislation also specifies that these lands "will not be utilized for public recreational facilities without the approval of the Navajo Tribal Council." This affects lands where water-based transportation facilities could be constructed.

Public Law 90-537, Colorado River Basin Project Act of 1968. This law established an operational program for the upper and lower basin portions of the Colorado River. It established a full pool for Lake Powell at elevation 3,700 feet. With this legislation, Rainbow Bridge had its primary access changed from land to water.

September 11, 1970, "Memorandum of Agreement among the National Park Service, the Bureau of Indian Affairs, the Bureau of Reclamation, and the Navajo Tribe of Indians, on the use and development of the Glen Canyon National Recreation Area and adjacent Tribal lands." This agreement recognizes Navajo Tribe preference rights to operate concessions on Parcel "B" lands.

Public Law (P.L.) 92-593, October 27, 1972, 86 Stat. 1311. This law established Glen Canyon National Recreation Area to ". . . provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto in the States of Arizona and Utah and to preserve the scenic, scientific, and historic features contributing to public enjoyment of the area . . .". Rainbow Bridge National Monument is accessed from the Glen Canyon National Recreation Area.

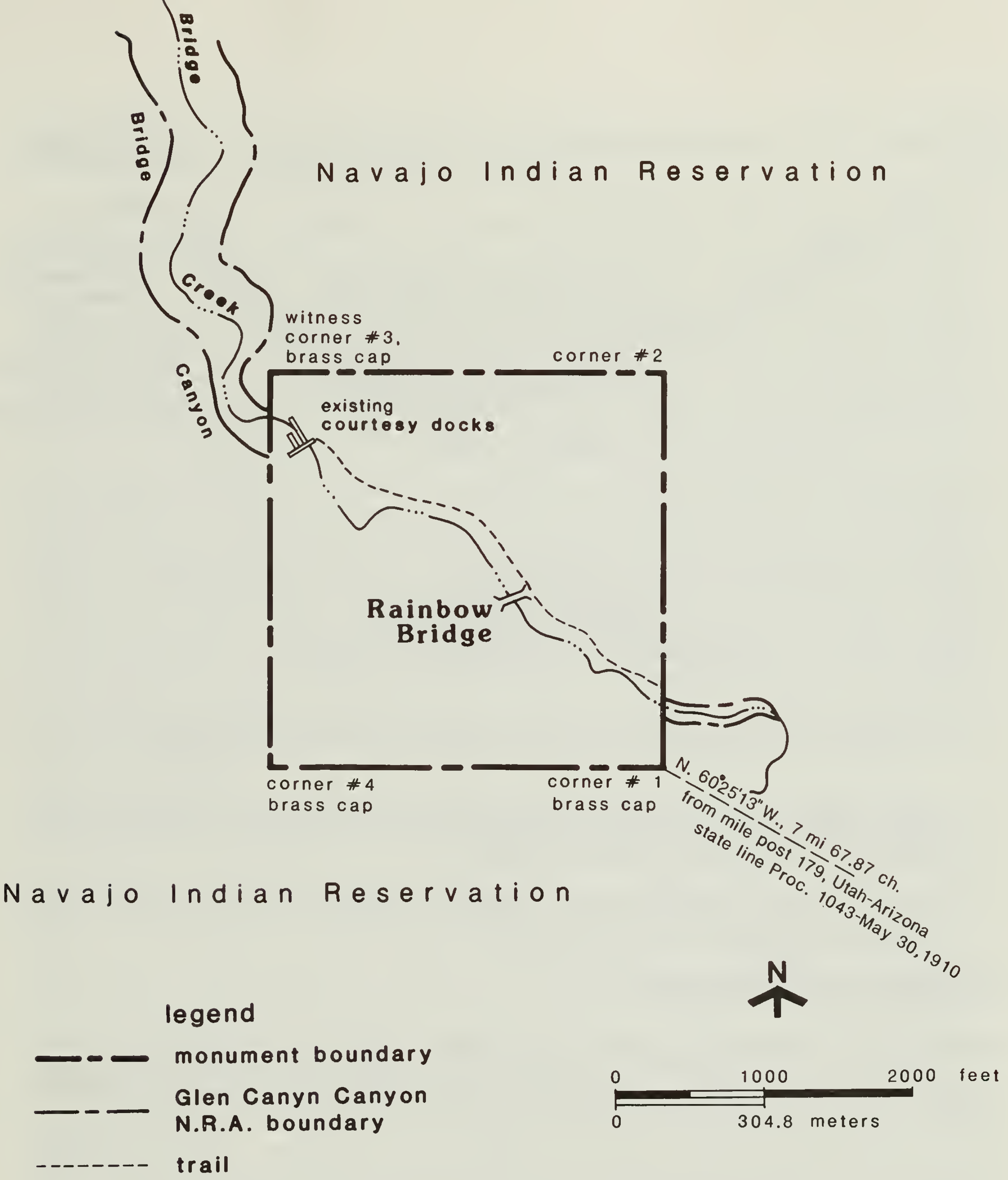
Management Objectives

Management objectives outlined in the current Statement for Management are:

- To preserve Rainbow Bridge by such means as will leave this outstanding natural resource unimpaired for the enjoyment of present and future generations.

- To identify, determine the significance of, and protect the cultural resources within the national monument.

- To promote public understanding and appreciation of Rainbow Bridge and the monument's other natural resources in a setting as free as possible from the influence of human activities.


Bridge
Bridge
Creek
Canyon
Navajo Indian Reservation
witness corner #3, brass cap
corner #2
existing courtesy docks
Rainbow Bridge
corner #4 brass cap
corner # 1 brass cap
N. 60°25'13" W., 7 mi 67.87 ch. from mile post 179, Utah-Arizona state line Proc. 1043-May 30, 1910
Navajo Indian Reservation
N
legend
monument boundary
Glen Canyon Canyon N.R.A. boundary
trail
0
1000
2000
feet
0
304.8 meters

Boundary Map

Rainbow Bridge National Monument

T.43S.,R.8E., Section 1

U.S. Dept. of the Interior - National Park Service

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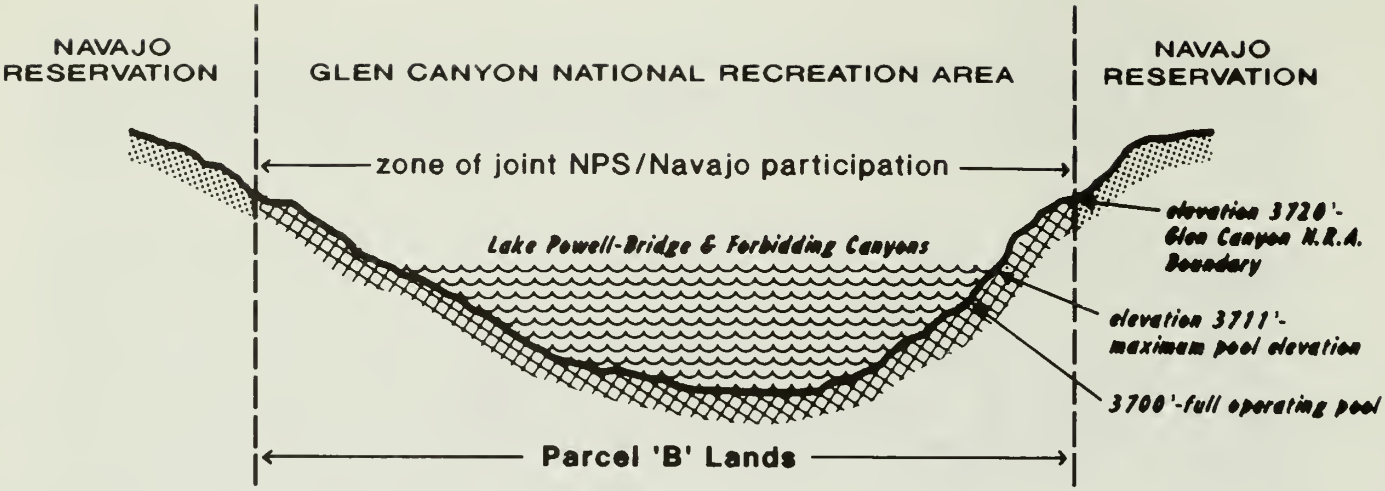

NAVAJO RESERVATION
GLEN CANYON NATIONAL RECREATION AREA
NAVAJO RESERVATION
zone of joint NPS/Navajo participation
Lake Powell-Bridge & Forbidding Canyons
elevation 3720'-Glen Canyon N.R.A. Boundary
elevation 3711'-maximum pool elevation
3700'-full operating pool
Parcel 'B' Lands

Figure 1
Parcel 'B' Lands
Bridge and Forbidding Canyons

- To determine and interpret the cultural significance of Rainbow Bridge.
- To cooperate with the Bureau of Reclamation to insure that management of the Lake Powell impoundment is compatible to the greatest degree possible with the long-term preservation of Rainbow Bridge.
- To foster and maintain a cooperative relationship for the use and protection of the national monument with the Navajo Tribe.

PLANNING BACKGROUND

Rainbow Bridge is the world's largest natural bridge. Presidential Proclamation Number 1043, dated May 30, 1910, set aside Rainbow Bridge and the surrounding 160 acres under the authority of the 1906 Antiquities Act, providing recognition and protection for the area. The proclamation described the bridge as "an extraordinary natural bridge...of great scientific interest as an example of eccentric stream erosion". The 1916 enabling legislation of the National Park Service tasked the service "...to provide for the enjoyment" of persons visiting parks and monuments "...in such a manner and by such means as will leave them unimpaired for future generations."

Rainbow Bridge is a unique natural resource of national and international significance. Natural bridges, which are caused by stream erosion, are less common than arches in the canyons of the Colorado Plateau. The formation of Rainbow Bridge was dependent on the presence of a hard layer of Kayenta sandstone underlaying the softer Navajo sandstone, forcing stream erosion to cut through a tight meander in the upper layer of the

Navajo sandstone. The resulting formation is impressive for its span, height, and symmetrical shape caused by the erosion process.

Rainbow Bridge NM is managed under the general guidelines contained in the General Management Plan for Glen Canyon National Recreation Area. The monument has a Statement for Management, which was approved in July 1985. The monument has been managed and staffed by Glen Canyon NRA personnel since the creation of the NRA. Visitation has been rising annually, similar to the rises seen in the adjacent NRA. Current visitation is more than 200,000 annually, with the majority of visitor use occurring between April and October. Because the monument is located on Lake Powell, visitors do not often distinguish between the monument and adjacent NRA. When completed, the Rainbow Bridge GMP/DCP/IP/RMP will be compatible with the Glen Canyon NRA GMP.

A major issue in the past has been the protection of Rainbow Bridge from any adverse impacts due to the impoundments of Lake Powell. In an act dated April 11, 1956, titled "Monument to be protected from impairment in connection with Colorado River Storage project," Congress authorized the Secretary of the Interior to take adequate protective measures to preclude impairment of the Rainbow Bridge National Monument. In a suit settled August 1973 (Friends of the Earth, *et al.*, v Armstrong, *et al.*), the 10th Circuit Court decreed that the Bureau of Reclamation monitor effects of Lake Powell incursion into Rainbow Bridge National Monument for 10 years. That was completed in June 1985, and showed no change or adverse effect on the structural stability of the bridge. The Bureau of Reclamation and National Park Service have elected to continue the monitoring program indefinitely.

Along that portion of Lake Powell extending from the Page townsite eastward along the Colorado and the San Juan Arm, lands below the 3,720-foot contour were acquired by the Federal Government by land exchange with the Navajo Tribe (Exchange Act of September 2, 1958, 72 Stat. 1686). In relinquishing these lands (known as "Parcel B" lands), the tribe retained the mineral rights. The legislation also specifies that these lands "shall not be utilized for public recreational facilities without the approval of the Navajo Tribal Council." A Memorandum of Agreement among the National Park Service, Bureau of Indian Affairs, Bureau of Reclamation and Navajo Tribe, on the use and development of the Glen Canyon NRA and adjacent tribal lands, was approved September 11, 1970. This agreement guides all planning and development for Parcel "B" lands. The shores of Lake Powell adjacent to Rainbow Bridge NM that are within Glen Canyon NRA are Parcel "B" lands. The remaining adjacent lands are part of the Navajo Indian Reservation. (See Boundary Map.)

The 1970 Memorandum of Agreement may have an effect on the alternatives considered in the plan. It states that the Navajo Tribe is authorized to construct, contract for, and manage all income-producing facilities on Navajo Sites and on Parcel "B" lands, excluding the then existing Rainbow Bridge Marina. It also says that the facilities and services on Parcel "B" lands will be administered "as outlined in a management and development plan to be written and approved by both the tribe and the Service". The Service is also authorized to use Parcel "B" lands for construction of non-income-producing recreational facilities "mutually agreed to be needed in connection with recreational development and use." This agreement also recognizes the Navajo Tribe as having the first right of preference for income-producing concession operations to Rainbow Bridge, if these operations are located on Parcel "B" lands.

ARA Services, the major concessioner in the Glen Canyon NRA, currently conducts boat tours from Wahweap and Bullfrog Marinas into Rainbow Bridge NM. Operations are not located on Parcel "B" lands. As a result of the legislation and interwoven agreements, careful coordination needs to be done with the Glen Canyon NRA, the Navajo Nation, and concession interests.

The Rainbow Bridge has religious importance to the Navajo Nation. The American Indian Religious Freedom Act of 1978 established a policy for protecting and preserving the American Indians' right to believe, express, and exercise their traditional religion. This includes guaranteeing access to traditional sites and use of sacred objects. The National Park Service must assure that its general regulations on access to, and use of park lands and park resources are applied in a balanced manner that does not interfere with an American Indian group's use of historically traditional places or sacred sites located within park boundaries. Rainbow Bridge is such a place.

Support services and staff for the monument are currently located at Dangling Rope Marina, which is ten miles west of the monument on Lake Powell. This marina was recently moved from Forbidding Canyon near the monument to solve problems of human waste, isolation of employees, crowding and inadequate fuel storage facilities. Travel time for boats from Lake Powell's marinas to the monument varies from 1 to 3 hours, but most boats cannot make a round trip to Rainbow Bridge without a fuel stop. Rainbow Bridge is a major visitor destination on Lake Powell. The planning for both visitor safety and experience needs to coordinate the relationship of Dangling Rope and its staff and support facilities to the management of the monument.

ISSUES

The following issues constitute the significant subjects identified for analysis thus far. These issues will provide the preliminary focus for this planning effort.

HOW SHOULD THE MONUMENT BE MANAGED TO PROVIDE A QUALITY VISITOR EXPERIENCE?

There is a need to define the desired character of the visitor experience within the monument. Rainbow Bridge is a natural wonder and a place that has religious significance to the Navajo people. Visitor use of the monument needs to be managed in such a way that it will be compatible with these factors. Current management of the area does not strongly differentiate its use from that of Glen Canyon NRA, so that visitor use is oriented to water-based recreation and sightseeing.

The following issues should be addressed:

- There is a need to establish the carrying capacity of the monument, which will provide for a quality visitor experience. Carrying capacity should consider three factors: dock space in the monument itself, capacity of the narrow canyon approach to the monument and people at one time on the trails and walkways within the monument. All three factors need to be weighed against resource protection needs.

- Management zoning for the monument (natural, cultural, development, etc.) needs to be established.

- Appropriate v. inappropriate uses of the monument need to be defined.

HOW SHOULD RAINBOW BRIDGE NM BE MANAGED TO INSURE PROTECTION OF THE MONUMENT'S NATURAL AND CULTURAL RESOURCES?

There is a need to establish management guidelines and policies that insure the protection of the monument's resources. Of foremost concern is the protection of Rainbow Bridge itself against any human impacts, as this was the specific purpose in the creation of the monument. While extensive monitoring of the bridge has shown no adverse impacts from the impoundment of Lake Powell, management needs to provide protection against other human impacts such as graffiti and general degradation of the natural scene due to visitor use.

Visitor use has resulted in significant impacts to the monument's resources, including trampling of vegetation and multiple trailing, rock graffiti, litter, and increased noise levels (caused by voices, boats and overflights), which disturb the tranquil setting of the monument. In addition, increased levels of visitor use pose a threat to water quality and to the archeological and historical resources within the monument. Therefore there is a need to provide a balance between preservation of the monument and visitor use.

Additional resource concerns are the invasion of tamarisk (an exotic tree species that is widespread in the Colorado River Basin) and the potential impacts from livestock should the monument not be protected by fencing. Tamarisk has spread rapidly in the monument in recent years and adversely impacts the natural vegetation and visitor views of the monument.

Cultural resource issues that must also be addressed are: Which cultural and natural resources do contemporary American Indians define as significant, and what are the forms and frequencies of use? How do traditional uses affect the resources, and what does traditional use imply for the management of the monument?

Rainbow Bridge has a range of traditional resource uses to the Navajo people, and possibly other American Indians. There is a need to research the importance of the bridge to these groups and their traditional uses of the monument. Based on the findings of this research, the National Park Service must manage the monument in such a manner that it does not interfere with an American Indian group's use of traditional sites or sacred objects. Specific requirements are spelled out in the National Park Service Management

Policies, 1988. In general, there is a need to determine how the traditional use of resources of the monument should affect the interpretation and visitor use of the area.

HOW SHOULD ACCESS TO THE MONUMENT BE PROVIDED TO INSURE PROTECTION OF VISITORS AND THE MONUMENT RESOURCES?

The existing access to the monument is by water, through Forbidding and Bridge Canyons of Lake Powell, or by land on hiking trails from the Navajo Reservation. The overwhelming majority of visitors boat into the monument, traveling either on private boats, on boat tours given by the concessioner at Glen Canyon NRA, or on concessioner rental boats. The access through Forbidding and Bridge Canyons is narrow and winding, with the canyon width varying from 50 to 400 feet. The increasing visitation to the monument in recent years has created problems of congestion and safety related to the water access to the monument. Specifically:

- Management staff has observed many boats traveling at full speed through these canyons into the monument. This creates risks of boat collisions as they approach each other around blind corners. It also creates wakes, which bounce off the canyon walls and make navigation difficult for later traffic.

- The mix of small boats and large boats traveling into the monument is particularly dangerous, as the wakes from the large boats can swamp the smaller boats.

- The amount of traffic passing through these canyons on busy days always leaves the access channel rough and choppy and also creates higher noise levels.

- Dock space at the monument is limited and visitors often have to wait for a spot to open up before they can dock and visit the monument.

- The unrestricted access to the monument can create a situation of overcrowding on the docks and trails in the monument.

Some other concerns related to visitor access to the monument are insuring that the plan provides for access via the hiking trails into the monument and the issue of scenic overflights of the monument - are they an appropriate means of visiting the monument or do they pose a threat to the quality of the visitor experience at the monument?

WHAT INTERPRETIVE THEMES, SERVICES AND FACILITIES SHOULD BE PROVIDED TO ENHANCE THE VISITOR EXPERIENCE AT THE MONUMENT?

There is a need to develop interpretive themes for the area to guide the interpretive program. These themes would include the geologic significance of Rainbow Bridge, its natural and human history and its traditional use by American Indians. However, these themes need to be researched and developed to build the foundation for the monument's interpretive program. An important goal of the monument's interpretation, as well as its overall management, is to convey to the visitors the message that the monument is a special place, apart from the rest of Lake Powell, and that it was set aside, not for recreation, but to preserve a natural wonder.

There is also a need to determine what services and facilities are required to effectively convey the interpretive message to the public. Is the interpretive message best conveyed through personal contacts or are exhibits and displays adequate? What interpretation should be done in Glen Canyon NRA to inform visitors about Rainbow Bridge? How can tour boats be used to better convey the interpretive message? What facilities (exhibits, etc.) are needed at the monument for an effective interpretive program and where would they best be located? Are memorials to persons involved in the history of the monument appropriate for the monument and if so, where should they be located? How can programs and facilities best be made accessible to the visually, mentally, hearing, and physically impaired?

WHAT FACILITIES AND SERVICES NEED TO BE PROVIDED AT THE MONUMENT TO SERVE ITS VISITORS AND PROTECT ITS RESOURCES?

There is a need to determine the types of facilities and levels of staffing required to protect the monument's resources, protect its visitors and provide needed services for its visitors. Some of the issues are listed below.

- How should the problem of human waste be handled?
- Should the trails within the monument be upgraded?
- What views of Rainbow Bridge should be provided?
- What signing and navigational aids are needed to control the monument's visitors, both on land and on water?
- What access-related facilities are needed, both in the monument and in Glen Canyon NRA?
- What concession services are required to serve the visitors?
- What fencing is required to protect the monument from livestock?
- How should litter be handled and controlled?
- What rockfall hazards exist within the monument and how should the public be protected from this hazard?
- What docks and walkways need to be provided?
- What level of staffing is required to control the monument's visitors, protect its resources, maintain its facilities and to provide interpretation for its visitors?

PUBLIC INVOLVEMENT

Public involvement for the project resulted from news releases and brochures describing the planning project and soliciting public input. The scoping brochure was released in December of 1988. Comment time allowed for public input on the initial issues outlined in the scoping brochure was 30 days. Responses were received and incorporated into planning for this project and were considered during the formulation of alternatives. Consultation with concessioners, the Navajo Tribe, and other Federal/State Agencies have also taken place. In addition, the public will be involved during review of the plans/environmental assessment and the final plan.

THE PROPOSAL AND ALTERNATIVES

INTRODUCTION

The proposal in this chapter and the documents in the appendix constitute the Park Service's proposed General Management Plan, Development Concept Plan, Resource Management Plan and Interpretive Prospectus for the Rainbow Bridge National Monument. Alternatives, also displayed in this chapter, were developed to address the issues in various ways. Each alternative has a different emphasis. Consequently, each provides a different response to the issues.

There are two basic limitations dealing with access restrictions and visitor patterns that have a direct bearing on the proposal and alternative development: (1) the ease of access provided by Lake Powell; (2) the physical limitation of the access channel from the Glen Canyon NRA and the physical limitation of Rainbow Bridge National Monument, itself, to absorb visitors.

First, the modern day uses of Lake Powell and the ease of access that the new reservoir provides have directly resulted in a growing number of visitors to the monument. The Colorado River Storage Project Act (Public Law 84-485, 70 Stat. 105, April 11, 1956) changed the way Rainbow Bridge was accessed from land to water, connected it to the recreation area, and, in time, significantly increased visitation because of easier access. Use increased in an uncontrolled manner in the narrow and confined Bridge and Forbidding Canyons as well as the physically limiting space of Rainbow Bridge. This eventually brought about the need for increased resource protection and the actions outlined in the proposal.

The act that established the National Park Service in 1916 outlined its fundamental purpose in managing parks, monuments and reservations "... which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such a means as will leave them unimpaired for the enjoyment of future generations." Preservation of the monument's resource and providing for the enjoyment of the monument by the public are now on conflicting courses. *The proposal and the alternatives must walk a fine line in resolving the issues of both protection of the resource and management of monument for the enjoyment of people.*

Second, although the Rainbow Bridge National Monument comprises about 160 acres, the space directly accessible to the public and from where Rainbow Bridge can be viewed and appreciated by visitors comprises less than one percent of monument's total area. The linear relationships of the narrow canyon walls and viewing points within this area limit the capacity of the monument for boats and people. The actual physical capacity for this area to hold people and boats at any one time needed to be considered during the planning process. The planning team undertook a carrying capacity study to determine the physical limits of the monument for boats and people. The results, as well as the assumptions used, are documented in Appendix A. Carrying capacity for the monument and dock space based on this study are used to estimate requirements for the proposal and each alternative. A limit for the monument was derived from the comparison of the three variables - carrying capacity of the monument (PAOT - persons at one time), carrying capacity of the monument dock (BAOT - boats at one time), and the capacity of the access channel. The three capacities were combined to determine the most limiting factor and that estimate was used to set the limits on the number of people allowed at the monument at any one time. In all cases, the most limiting factor was the carrying capacity for the monument.

Upon completion, the proposal would modify management within Glen Canyon National Recreation Area. Actions, however, are considered to be within the framework of the existing General Management Plan for the Glen Canyon NRA. The alternatives were formulated to include a wide range of management options. In addition to the National Park Service proposal, other alternatives were considered in detail. This includes the minimum management and no-action alternative reflected by existing conditions.

ALTERNATIVES CONSIDERED, BUT NOT IN DETAIL

Several alternatives were considered by the interdisciplinary team during the alternative formulation process. These were slight modifications to the ones presented. Following is brief description of those alternatives considered and brief explanations as to why they were not included in the final set for selection:

- Other locations for a shuttle transfer dock were looked at but considered infeasible because of economics, transportation operations, lack of space, and exposure to severe weather. Those were locations in the main channel just north of the entrance to Forbidding Canyon, at Dangling Rope, at a location on the south side of Lake Powell, just west of the entrance to Forbidding Canyon, and at a location just inside of Forbidding Canyon.

- Consideration was given to locating all trails at the monument on the southwest side of the channel. This was discarded because this would have disturbed previously undisturbed areas of the monument, space for a trail under the bridge was too narrow, and a trail on this side would allow easy access for people wanting to climb on top of the bridge.

- Consideration was given to moving the path system below contour 3,705 on the east side. This would have required the excavation of a path into Kayenta sandstone. The effect on the appearance of the bridge made this unacceptable.

- Consideration was given to an entry control system somewhere at the mouth of Forbidding Canyon. This would have required a large holding area for boats awaiting entry. Establishing this entry system would have caused safety as well as maneuvering problems for boats and was dismissed as infeasible.

- Consideration was given to a mini shuttle within the monument boundary. Under this alternative, a second shuttle would be run within the boundary from the existing dock to the shore. This was discarded because of expense, disruption of visitor experience, and the fact that it could not accommodate the disabled visitor easily.

OVERALL MANAGEMENT

The following management guidelines and policies apply to all alternatives:

- Inappropriate visitor uses and activities will be prohibited in the monument. The following activities are not considered to be appropriate or compatible with visitor experience, visitor safety, and resource protection of Rainbow Bridge National Monument: water sports of any kind, camping, swimming, climbing, diving, sunbathing, hunting, fishing, overnight use, rock-throwing, feeding wildlife, and special events. Pets will also be prohibited. Monument memorials, except as specifically permitted by the National Park Service, will be prohibited.

- Geologic hazards exist all along the entrance canyon to the monument from Lake Powell and at the Rainbow Bridge NM itself. Before entering the monument, visitors will be informed of the potential hazards of the monument area.

- Flash floods can occur in the canyon area, especially at the tributary entrance points to the canyon. Visitors will be informed of the potential for flash floods. A weather warning system will be instituted (See Appendix D, Flash Flood Mitigation Plan). A warning device will be placed on the dock area to alert visitors to impending flash floods. Signs will be posted along trails instructing visitors what to do should severe thunderstorms and flash floods occur. Boat landings at locations other than the Rainbow Bridge dock will be prohibited.

THE PLAN - NPS PROPOSAL (Seasonal Contact Station with a Future Seasonal Shuttle)

Summary of the Proposal

The National Park Service proposal responds to resource protection, park management and operations, and visitor use needs (quality and safe recreation, visitor access, concession services, and interpretive themes and facilities). It calls for a two-phase approach for management of the monument.

In the first phase, a seasonal contact station would be constructed at a location shown on the Water Access-Proposal map, an entrance fee would be charged at the contact station, NPS interpreters would be provided on concession tour boats, and improvements would be made to the monument for the protection of resources. The contact station would give park management the ability to limit use to coincide with the monument's carrying capacity and to protect park resources. Capacity would be allocated equally between tour boats and private craft.

In the long term, use may increase human-related impacts and threaten the protection of Rainbow Bridge. As a result, Phase II includes provisions for a future seasonal shuttle transportation system if park management determines its use is necessary to protect resources at Rainbow Bridge and alleviate congestion in the access channel. This would include the expansion of the contact station dock into a transfer dock for the shuttle system, the purchase of six shuttle boats, and the addition of housing at Dangling Rope. Phase II would only be implemented if, in the judgement of the National Park Service, visitation rises to a point that clearly threatens the protection of resources at Rainbow Bridge and/or boat navigation in the water channel becomes unsafe.

Both contact station and shuttle would be operated on approximately a six-month season.

This alternative is constructed to more evenly distribute use during the day. Based on a carrying capacity study done for the monument (see Appendix A), peak visitation capacity for the monument is 390 persons at one time. One hundred and ninety five PAOT would be allocated for tour boats and 195 PAOT allocated for use by private boats. This would limit docking facilities at the monument to approximately 25 spaces for private boats, 3 spaces for tour boats, and 2 spaces for park boats.

In both Phases I and II of the proposal, park management would have the ability to limit visitation to correspond with the monument's carrying capacity and encourage the distribution of use throughout the day and into the off-season.

Specifically, the proposal would respond to the planning issues identified during this planning effort as follows:

Quality Visitor Experience. The proposal would accommodate increasing levels of visitor use with the least amount of human-related resource impacts, maximize opportunities for public education, and minimize visitor conflicts currently existing in the narrow access channel and congested courtesy dock. The proposal would improve the opportunities for visitor and interpretive services by giving interpreters an opportunity to provide programs to captive audiences, with a minimum of disturbance from other visitors. Use of the monument by visitors only interested in recreational pursuits would be discouraged through the collection of entrance or shuttle fees. Establishment of carrying capacity limits would prevent overcrowding and congestion in the monument and smooth the distribution of visitors throughout the day.

Protection of Natural and Cultural Resources. Natural Resources would be protected. The proposal would provide for management zoning. Visitor impacts would be reduced by confining visitors to trails. Litter containers would be placed where needed. Eroded areas would be rehabilitated. All graffiti would be removed and the area would be rehabilitated. A permit system for land access would be initiated if needed. To respond to noise from aircraft overflights, the proposal would seek increased enforcement of altitude regulations and request that the Federal Aviation Administration (FAA) issue advisories concerning low-level aircraft overflights. Tamarisk would be completely eradicated, and the livestock fence would be improved. The NPS would continue to cooperate with the Bureau of Reclamation to monitor the long-term stability of the Rainbow Bridge. The BOR would continue to perform annual rockfall hazard inspections. Visitors would be informed on the rockfall hazard of Rainbow Bridge and moved through existing rockfall areas as quickly as possible. Existing signs and interpretive areas would be located as far away as possible from rockfall areas. Water quality would be monitored and the area would be equipped for spill containment. Threatened and endangered species would continue to be monitored. A flash flood monitoring plan would be implemented and an accompanying alarm system would be installed. The monument would be closed when conditions were favorable for flash floods.

Cultural resources would be protected. Visitors would be restricted to hardened and defined trails, reducing the likelihood of visitors impacting known and unknown cultural resource sites. The proposal would maximize the use of interpretation and enforcement for cultural resource protection. American Indians would be allowed on restricted areas of the monument for religious reasons, by permit. The proposal would maximize the use of cultural resource themes provided in the Interpretive Prospectus. Existing memorials would be relocated to appropriate interpretive areas. The monument would be closed to the public for one day a year for American Indians. The day would fall during the off-season and be designated by the superintendent. Hours of operation of the monument would be posted in the local Indian chapter houses. No development would occur directly underneath the bridge.

Access to Rainbow Bridge. Access would be managed with a two-phase approach. After Phase I implementation, all boats would be required to stop at the contact station and pay a fee prior to proceeding to the monument. If the monument were full (above the carrying capacity limits shown in this plan), no boats would be allowed to proceed. If the contact station/transfer dock were full, the electronic notification device would inform boats entering Forbidding Canyon. Thus the congestion problem now existing at the monument courtesy docks would be entirely eliminated from the monument and Forbidding Canyon. In addition, boats traveling beyond the contact station would be required to travel at wakeless speed, thus eliminating the wake and safety problems currently existing in Bridge and Forbidding Canyons. Concession tour boats would be required to stop and pick up an interpreter at the contact station prior to completing the trip to the monument. During the off-season, the contact station would be closed and all boats allowed to proceed directly to the monument. The season would be determined by the superintendent after an annual review of visitation for the monument.

After Phase II implementation, when the shuttle was operational, the monument would be closed seasonally to all boats except concession tours. Private boats would be required to park at the transfer dock and take a shuttle to the monument. A shuttle providing interpretive services would be operated seasonally between the transfer dock and the monument dock. Concession tour boats would be required to stop at the transfer dock to pick up an interpreter, prior to completing the trip to the monument. The monument would be open during the off-season to private boats. The season would be determined by the superintendent after an annual review of visitation for the monument.

Interpretive Themes, Services, and Facilities. Themes include Geological Processes that Formed Bridge, Rainbow Bridge: Part of the Larger Colorado Plateau Ecosystem, People Have Interacted with the Bridge in Historic Times, and Human Activity's Impact on the Monument. There would be three primary forms of interpretive services - wayside exhibits, personal services and printed material. During Phase I, visitors would have the opportunity to speak with rangers, view wayside exhibits, and pick up informational brochures at the floating contact station. Phase II implementation would add the opportunity for interpretive talks, while visitors are taking the 15-minute shuttle ride into the monument.

Facilities and Services. Facilities are broken down into three areas: facilities at the transfer dock, at the monument dock, and on land at the monument.

In the channel, Phase I facilities would include a small contact station with slips for visitor docking. Phase II would expand the contact station to a transfer dock, which would include additional slips for visitor and administrative docking, an indoor comfort station with chemical-oil-operated toilets, and a small indoor visitor contact station providing a Natural History Association outlet.

At the monument, the existing dock would be modified slightly. A small floating interpretive platform would be constructed to provide visitors a view of Rainbow Bridge from the water. The existing restroom would be moved and improved. A small moveable dock connection to land would be constructed to help adjust to fluctuating lake levels.

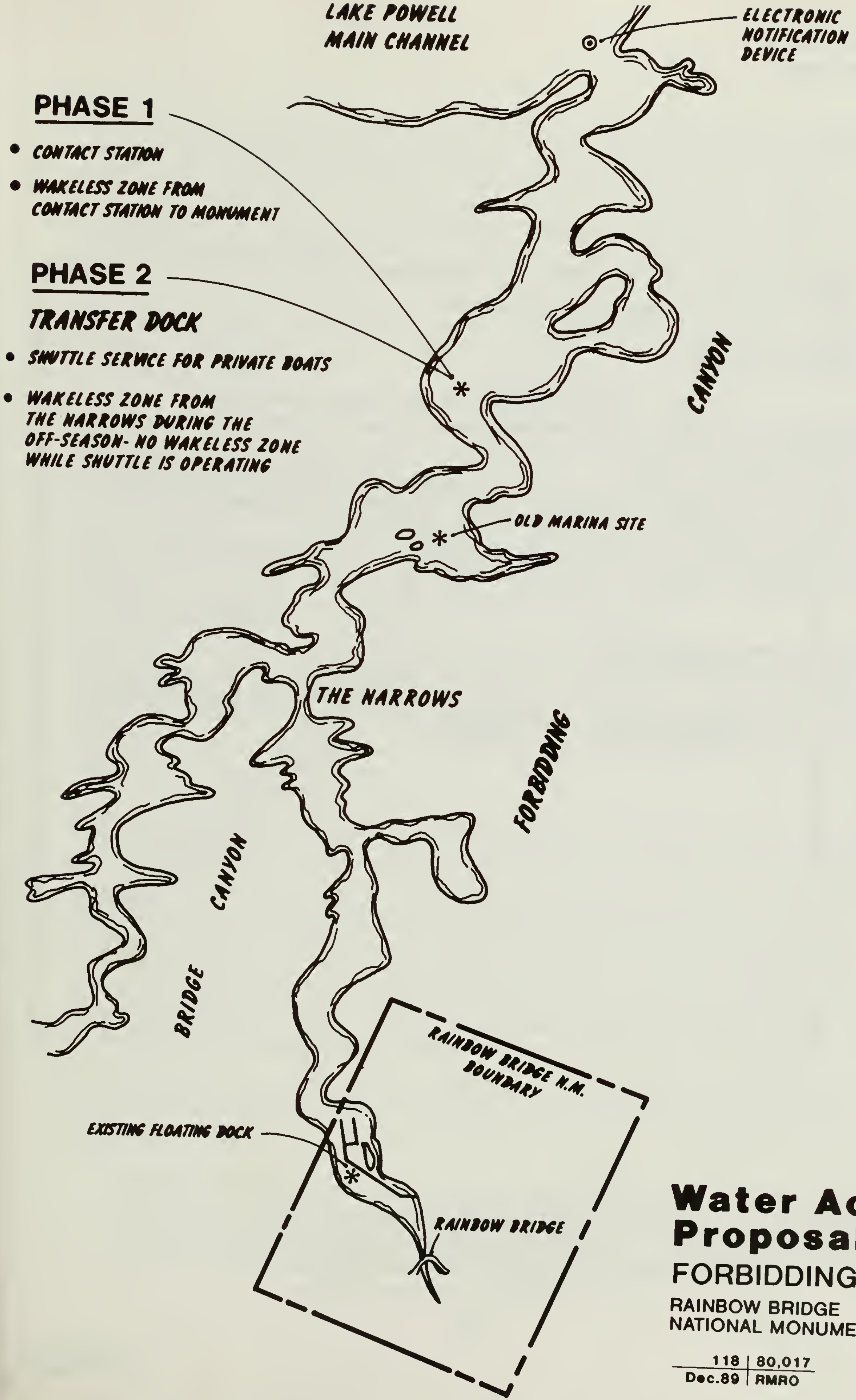
A small hardened trail would be constructed on land to a hardened congregating area. The existing land access trail would be maintained from the hardened congregating area to the monument boundary. The area under Rainbow Bridge would be restored to a natural condition.

The total number of people that could be accommodated at one time would be approximately 390 during peak season use. The capacity of docking facilities and channel control previously discussed would be used to regulate the number of visitors at the monument at any one time.

General Development

Introduction. Development for the proposal is broken down into two categories: development for water-based access and land development at the monument. The reader should refer to Water Access-Proposal and Proposal maps, when reviewing the text for the proposed general development.

Water Access. During peak season, the proposal calls for the use of a contact station in Phase I and a shuttle transportation system in Phase II, if implemented. This would restrict the use of private boats in the monument between approximately May 15 and October 15. The exact dates would be established by the superintendent after an annual review of the previous year's visitation figures.



PHASE 1

- CONTACT STATION
- WAKELESS ZONE FROM CONTACT STATION TO MONUMENT

PHASE 2

TRANSFER DOCK

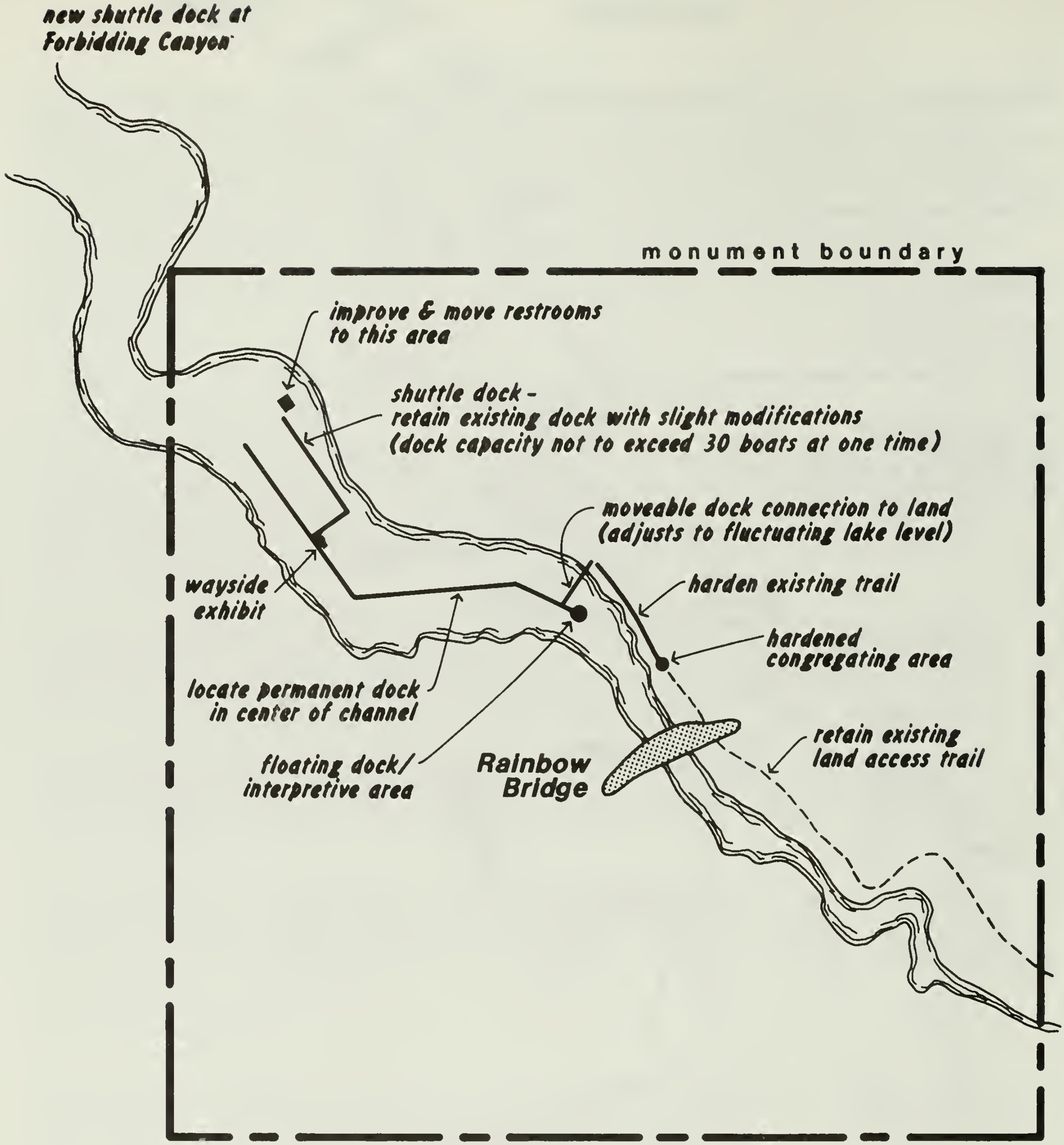
- SHUTTLE SERVICE FOR PRIVATE BOATS
- WAKELESS ZONE FROM THE NARROWS DURING THE OFF-SEASON- NO WAKELESS ZONE WHILE SHUTTLE IS OPERATING

Water Access Proposal

FORBIDDING CANYON

RAINBOW BRIDGE
NATIONAL MONUMENT

118 | 80,017
Dec.89 | RMRO


new shuttle dock at Forbidding Canyon
monument boundary
improve & move restrooms to this area
shuttle dock - retain existing dock with slight modifications (dock capacity not to exceed 30 boats at one time)
moveable dock connection to land (adjusts to fluctuating lake level)
harden existing trail
wayside exhibit
hardened congregating area
locate permanent dock in center of channel
retain existing land access trail
floating dock/ interpretive area
Rainbow Bridge

Proposal

Rainbow Bridge National Monument

U.S. Dept. of the Interior – National Park Service

118 | 80,014·
Dec.89 | RMRO

Phase I would require all visitors in private boats to stop at the contact station, pay an entrance fee, and receive interpretive information, before proceeding to the monument. Tour boats would stop and pick up an NPS interpreter prior to proceeding to the monument. The seasonal contact station would be constructed at a location shown on the Water Access-Proposal map. An electronic notification device would be placed at the mouth of Forbidding Canyon to notify visitors that the monument and contact station were full. Tour boat use would be allowed to increase from twenty-three percent of total visitation to fifty percent. Private boat use would be allowed to increase up to capacity, requiring a modest expansion of the courtesy dock to accommodate the additional visitation. Regardless, the total number of persons at one time at Rainbow Bridge would be restricted to 390.

The estimates of economic feasibility used for this document assume constant visitation at various ticket prices for the shuttle system, with the break-even point in the neighborhood of $4 to $8. Experience has shown that visitation will likely decrease with the imposition of fees. Therefore, the proposal calls for the completion of a market study prior to the implementation of Phase II. The purpose of the study would be to provide close estimates of visitation at various ticket prices. Information obtained may dramatically affect the National Park Service's operating budget or potential concessioner profitability.

Phase II would implement a seasonal shuttle transportation system. This would include the expansion of the contact station dock into a transfer dock for the shuttle system, the purchase of six shuttle boats, and the addition of housing at Dangling Rope. Phase II would only be implemented if, in the judgement of the staff, visitation rises to a point that clearly threatens the protection of resources at Rainbow Bridge or that navigation in the water channel becomes unsafe.

After Phase II implementation, the proposal would require visitors using private boats to use a shuttle system. To use the shuttle, visitors from private boats would transfer to the shuttle at the transfer dock. The shuttle would transport visitors from the transfer dock to the monument dock. Existing tour boats from Wahweap/Bullfrog would be limited to 195 PAOT. It is estimated that shuttle tour boats, having a capacity of 30 persons each, would take 10 minutes to load and unload, 10 minutes to transport visitors each to and from the monument, and would provide a 30-minute stay at the monument. Six 30-passenger shuttle boats would be used and would run on a 10-minute schedule. Based on these assumptions, the total number of persons at the monument at one time would be limited to less than 390.

During off-season use (October 16 to May 14), private boats would be allowed access during normal hours of operation. Concession boats from Bullfrog/Wahweap would be limited to 195,PAOT.

Seasonal Closure to Private Boats. During Phase II, seasonal closures to private boats and visitation would be evaluated yearly. Changes to seasonal restrictions in terms of either lengthening or shortening the restricted season would be made based on these yearly evaluations. The actual dates of closure for the following year would be determined by the superintendent.

Wakeless Zone. Phase I calls for a wakeless zone from the contact station to the monument during the entire year. During Phase II, when shuttles were in service, there would be no restrictions on boats. During the off-season, a wakeless zone would be established for all boats, from the narrows to the monument.

Contact Station and Transfer Dock. Under the proposal, management would allow the construction of a contact station/transfer dock facility between the mouth of the Forbidding Canyon and the Narrows. Phase I facilities would include a small contact station, with slips for visitor and administrative docking. Phase II would expand the contact station to a transfer dock, which would include additional slips for visitor and administrative use, an indoor comfort station with chemical-oil-operated toilets, and a small indoor visitor contact station, with a Natural History Association outlet.

Monument Capacity. Under the proposal, the monument capacity was the most limiting factor. The capacity for the monument is set not to exceed 390 persons at one time. This is based on a design providing a monument dock/low-impact trail system (800 linear feet) and retaining the remaining existing trail where visitors could view the monument (400 linear feet) for a total of 1,200 linear feet. This also includes the capacity of a floating dock interpretive platform, a low-impact, and hardened congregating area. Based on the carrying capacity coefficient of .151 PAOT/linear foot and the capacity of each congregating area (See Appendix A), it is estimated that the area can handle about 390 visitors at one time (390 PAOT).

Under the proposal, fifty percent of total capacity is set aside for concession use. Existing tour boat visitation represents about 23 percent of total visitation, therefore the proposed capacity represents a substantial increase over the existing situation. Visitation from private boats will also be allowed to increase from current levels to a total of 195 PAOT.

The Phase II transportation system moves people on a hourly basis. It is estimated that the capacity for Rainbow Bridge is about 390 persons per hour. In both phases, the proposal allows for the orderly sequencing and scheduling of visitors to the monument and helps to alleviate peak daily, as well as peak season, flows of visitors.

Visitation for a projected seven-month season in 1988 was 213,825. If the 390 persons per hour is used for the same seven-month season during shuttle operation, it is estimated that a cutoff in visitation would occur when the total reached 655,200 visits for the seven-month period.

Monument Dock. The existing courtesy docks would be expanded to accommodate the increase in private boat visitation during Phase I of the proposal. The dock would be realigned to be situated in the middle of the channel and as far away from existing rockfall areas as possible. The existing toilet would be relocated so that it did not block initial views of Rainbow Bridge. The dock area and restroom facility would be color-coordinated to blend in with the natural surroundings.

Lake Powell Low Water Scenario. The level of Lake Powell generally will fluctuate from 3,700 to 3,650 feet. According to a study done by the Bureau of Reclamation in 1986, the probability of the maximum water level being more than 3,700 was put at only 10 percent in year 2000. Using the same study, there is a 90 percent probability that the minimum lake level elevation would be greater than approximately 3,650 feet. (See Affected Environment, Water, Flood Plains and Wetlands.) However, as of the writing of this plan, water levels at the monument have dropped to 3,650 feet. The proposal has assumed that in no case would water recede to the point that it would be entirely removed from the monument (approximately 3,600 feet). In cases where water were less than 3,650 feet, the existing docking facilities would be moved and the old land trail, now submerged, would be hardened and used for access. The floating walkway and interpretive platform would be removed from the monument and stored at Wahweap or Dangling Rope. The interpretive waysides would be relocated from the floating platform to the low-water land trail. The courtesy docks would be connected to the land trail with a short walkway and the moveable land connection section.

Permanent Floating Interpretive Platform. Probably the most impressive view of Rainbow Bridge is from the water. This is illustrated on the photograph below. Under the proposal, the existing dock area would be modified to provide a permanent floating interpretive platform in the center of the channel. The dock area would also be relocated toward the center of the channel away from existing rockfall areas. The floating interpretive platform would rise and fall with the fluctuating lake level. A small moveable dock connection would slide back along the northern bank to allow different connection points at fluctuating lake levels from approximately elevation 3,660 to 3,700 feet. Final details of this scheme need to be thoroughly examined during the advanced design stage of plan implementation.

The floating interpretive platform area would provide enough space for interpretive displays and provide the stage for interpretive talks to large groups. The proposal calls for a 1,600-square-foot platform. This area has enough capacity to serve 32 persons at one time, or four parties of eight persons each, about the size of one shuttle boat-load of visitors.

Land Development at the Monument. Development of a small, low-impact trail and congregating area, while retaining the existing natural and native features of the existing trail and Rainbow Bridge, is proposed.

Low-Impact Trail. The proposal calls for constructing a low-impact trail generally following the existing trail alignment terminating at the congregating area. The trail would be carefully molded to the natural contours and fit the character of the existing landscape. The trail color and material would be coordinated to blend with the color of the existing Kayenta Sandstone. Access for disabled persons would

View of Rainbow Bridge from Water Channel

be improved.

Low-Impact Congregating Area. The proposal calls for the construction of a 1,600-square-foot congregating area. The area would be large enough to accommodate 28 visitors at one time and interpretive displays.

Existing Land Trail. This trail would be retained. Some eroded areas along the trail would be rehabilitated.

Land Use and Management. The Management Zoning map shows not only management zoning, but the political boundary, and The Proposal map shows proposed park development. This management zoning proposal shows the long-term allocation of the land resources within Rainbow Bridge National Monument. Three primary management zones are identified: 1) a Natural Zone, which contains about 94 percent of the monument area or 150.3 acres, including an Outstanding Natural Feature Subzone (0.4 percent of the monument area or 0.64 acres); 2) the Reservoir Zone, which includes about 17.6 water surface acres to the mean high water mark of Lake Powell (elevation 3,700 feet) within the monument boundary and is about 11 percent of the monument area, and 3) the Development Zone, which contains about 3 percent of the monument area, or 4.8 acres.

The Natural Zone provides for the conservation of natural resources and processes, and accommodation of uses that do not adversely affect these resources and processes. The Outstanding Natural Feature subzone provides for public appreciation and interpretation of geological or ecological features possessing unusual intrinsic value or uniqueness. The Reservoir Zone is used for major impoundments such as Lake Powell, whose mean high water line enters the monument's boundary on the northwest corner. The Reservoir Zone would include docks and related facilities required to provide water-based access to the monument. The Development Zone is land set aside to serve the needs of park management and visitors. This includes areas where park development and or intensity of use substantially alter the natural environment.

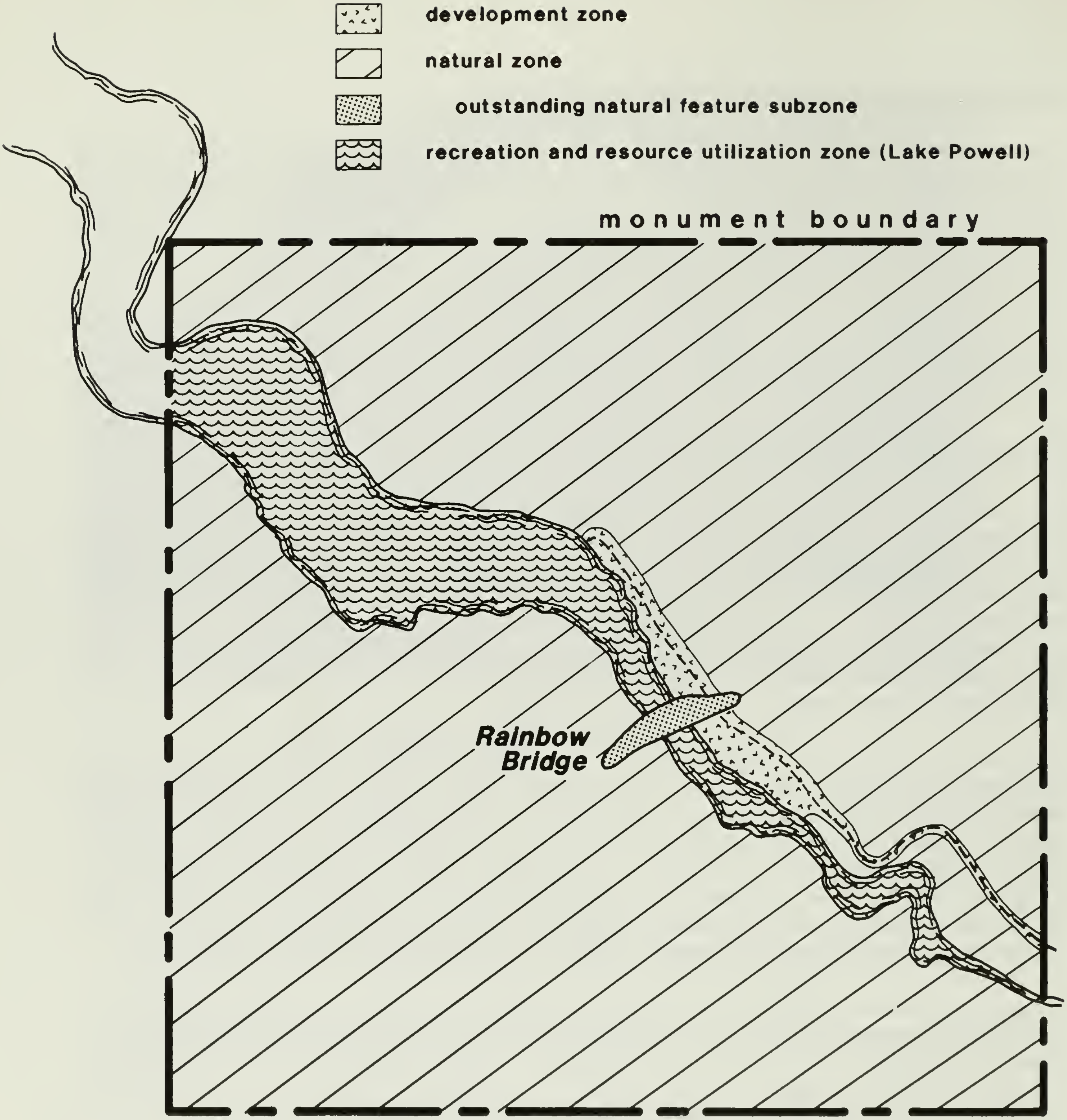
Visitor Use and Interpretation

Introduction. Visitation is exceeding 200,000 visitors annually. This occurs within the narrow confines of Bridge Canyon and the limited walkway of about 2,000 linear feet in Rainbow Bridge National Monument. The use of visitor services and interpretation has become a very important part of management's objective of maximizing the opportunity for visitors to see Rainbow Bridge and maintaining a quality visitor experience. *Two types of visitor conflicts occur: (1) those that affect the natural physical resource at the monument - visitor/resource conflicts and (2) those that affect the enjoyment of the monument by other visitors - visitor/visitor conflicts.*

The direct management provided by a contact station and a future seasonal shuttle transportation service, its season and schedule, would provide for the sequenced and orderly access to Rainbow Bridge by the public. Visitor access and circulation described previously (see General Development) rely on the premise that through organized, orderly access and management, the park can minimize visitor dissatisfaction. Under the proposal, the three key elements described under the interpretive prospectus (see Appendix B - Interpretive Prospectus) -- wayside exhibits, personal services, and printed materials -- play an important role by helping management with this objective.

Interpretation and Visitor Services. As described in the interpretive prospectus for this proposal, the themes would be (1) Geological Processes that Formed the Bridge; (2) Rainbow Bridge: Part of the Larger Colorado Plateau Ecosystem; (3) People Have Interacted with the Bridge in Prehistoric Times; (4) People Have Interacted with the Bridge in Historic Times; (5) Human Activity's Impact on the Monument.

The goals for interpretation under the proposal are to increase visitor understanding of the geology, plants, and animals of the region; to encourage visitor understanding of how Rainbow Bridge fits into the Colorado Plateau and ecosystem; to help visitors understand that different cultures perceive resources differently, i.e., neighboring American Indians regard Rainbow Bridge as sacred; to help visitors understand that the monument's resources do not end at its boundaries; to generate visitor interest in the cultures and lifestyles, from prehistoric to present times, of the people of the Rainbow Bridge region; to stimulate visitor and local citizen understanding of external threats to monument


development zone
natural zone
outstanding natural feature subzone
recreation and resource utilization zone (Lake Powell)
monument boundary
Rainbow Bridge

Management Zoning

Rainbow Bridge National Monument

U.S. Dept. of the Interior – National Park Service

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resources; to encourage visitor understanding of limited visitor access to Rainbow Bridge as one management device for reducing degradation of monument resources; to foster safe, informed, minimum boat and foot impact access to monument resources; to reduce visitor injury and hazards related to monument uses; to help visitors understand and appreciate their role in maintaining the monument's natural and cultural resources; to enhance the visitor's experience at Rainbow Bridge by providing a pleasant transition from a recreational activity to an environmental education experience; and to foster visitor enjoyment through awareness of available activities and services and time needed for each, both in the monument and in the Glen Canyon National Recreation Area.

Objectives are used to measure achievements. As more is learned about visitors and Service capabilities, these objectives may be modified. The following list is but a partial inventory of the objectives of the monument's interpretation program. Any necessary modifications and additions would be placed in the Annual Statement for Interpretation. Of the visitors leaving the monument, the objectives for interpretation would as follows:

> 80 percent will confirm that they received adequate information for a well-informed, safe, efficient, and enjoyable visit.
>
> 80 percent will be able to describe the primary resource that warrants the area's national monument designation.
>
> 80 percent will be able to identify Rainbow Bridge National Monument as a separate National Park area, distinct from Glen Canyon National Recreation Area.
>
> 80 percent will know that the Rainbow Bridge is sacred to neighboring American Indians.
>
> 80 percent will be able to identify water erosion and fracturing as the two main factors in the formation of Rainbow Bridge.
>
> 80 percent will be able to identify at least one management measure used to reduce impacts on the monument's resources.
>
> 50 percent will be able to identify human impacts affecting Rainbow Bridge.
>
> 50 percent will be able to identify at least one action they can take to prevent degradation to the Rainbow Bridge.
>
> 50 percent will know that prehistoric people once lived in and around the monument.

Concessions. Scheduling of boat tours would be coordinated by park management with the concessioners. Use would be limited to 50 percent of the monument's total carrying capacity, which equals 195 persons at one time.

Monitoring Visitor Use. Monitoring off-season use will enable the NPS to decide if seasonal closure dates should be extended or shortened depending on the circumstances.

Under the proposal, use would be evaluated each year and matched to carrying capacity of the monument. Monitoring would help evaluate the effectiveness of visitor management, while seeking to establish a longer or shorter restriction period based on the previous years' trends for both Phase I and Phase II operations.

Park Operations and Development Costs

Operations and Maintenance. Under the proposal, the shuttle boats would be provided and maintained by either the National Park Service or a concessioner. The transfer dock would be built and maintained by the National Park Service. Interpretation on the shuttle, dock security, fire, and emergency medical services (EMS) would be provided by the National Park Service.

Facilities for housing would be built and maintained by the concessioner for his employees and by the National Park Service for their employees. Housing would be at Dangling Rope.

Estimates for staffing are based on NPS operations only. NPS staffing levels required to implement this proposal are as follows:

Maintenance:	
Increased litter management	
Trail maintenance	
Tamarisk eradication	
Flood monitoring/alarm system	
Graffiti removal	
Floating interpretive platform	0.6 FTE
Dangling Rope - housing and utilities	2.4 FTE
Subtotal	3.0 FTE
Resource Management:	
Tamarisk eradication/graffiti removal	
Vegetation rehab/increased monitoring	1.0 FTE
Subtotal	1.0 FTE
Visitor Services:	
Increased interpretation at the monument	
Enforcement in the channel (no private boats)	0.7 FTE
NPS interpreter on tour boats at Forbidding Canyon	2.0 FTE
Subtotal	2.7 FTE

Shuttle System Operation (NPS):

Boat pilots (one permanent, 8 seasonal)	5.0 FTE
Deck hands (8 seasonal)	4.0 FTE
Shuttle tickets (1 permanent, 4 seasonal) (fee collection)	3.0 FTE
Security/EMS/fire at transfer dock	1.0 FTE
Boat mechanics	1.0 FTE
Transfer dock maintenance	0.5 FTE
Transfer dock sewer/water/fuel/trash/elec.	1.0 FTE
Fiscal clerk	1.0 FTE
Subtotal	16.5 FTE
TOTAL	23.2 FTE

The following is a Phase I and Phase II breakdown of FTE Needs:

Description	Phase I	Phase II	Total
Maintenance:	2.0	1.0	3.0
Resource Management	1.0		1.0
Visitor Services	2.7		2.7
Shuttle System Operation		9.0	9.0
Entrance Fee Collection	2.0	1.0	3.0
Security/EMS/Fire (Contact/transfer dock)	1.0		1.0
Boat mechanics		1.0	1.0
Contact/Transfer Dock			
Maintenance	0.5		0.5
Sewer/water/fuel/trash/elec.	1.0		1.0
Fiscal clerk	1.0		1.0
Total	11.2	12.0	23.2

Estimated annual operations and maintenance budget associated with Phase I of the proposal is $251,730 for salary and $167,820 for supplies, for a total of $419,550.

Estimated annual operations and maintenance budget associated with the completion of Phase II of the proposal (includes Phase I and Phase II annual costs), were the shuttle operated by the National Park Service, is $521,441 for salary, $347,527 for supplies, $128,000 for gas and oil and $138,600 for engine repair and replacement, for a total of $1,135,568.

Development Cost. The total costs as well as phased implementation of the proposal are shown in Table 1a.

Table 1a

PROPOSAL

Equipment Costs	
Forbidding Canyon	
Capital investment for 6 shuttle boats 30 ea/30' long	$300,000
1 Work barge	$50,000
Small patrol boat 6	$210,000
Total Equipment Costs	$560,000

Item	Gross Construction Costs	Advance & Proj. Plng. Costs	Total Project Costs
Phase I			
Rainbow Bridge			
Implement flash flood mitigation	$91,700	$17,500	$109,200
Construct floating platform 1,600 sf	$125,760	$24,000	$149,760
Improve restroom	$13,100	$2,500	$15,600
Improve & maintain land access trail 900 lf	$10,480	$2,000	$12,480
Construct moveable dock/land section 200lf	$157,200	$30,000	$187,200
Interpretive signs 12	$11,790	$2,250	$14,040
Low impact trail 800 lf	$51,236	$9,778	$61,013
Expand monument courtesy dock 10 boats 10 slips (240 sf ea.)	$188,640	$36,000	$224,640
Construct contact dock for 10 boats, 3 large boats 13 slips(240 sf ea.)	$245,232	$46,800	$292,032
Contact Station & comfort station	$144,100	$27,500	$171,600
Dangling Rope			
Construct 3-6 person dorm 1,400 sf ea	$467,670	$89,250	$556,920
Upgrade utility system	$327,500	$62,500	$390,000
Subtotal	$1,834,408	$350,078	$2,184,485
Phase II			
Dangling Rope			
Construct 3-6 person dorm 1,400 sf ea	$467,670	$89,250	$556,920
Duplex	$154,580	$29,500	$184,080
Forbidding Canyon			
Expand contact station to construct transfer dock for 30 boats, 10 large boats add 27slips(240 sf ea.) vistitor platform (6,400sf)	$1,012,368	$193,200	$1,205,568
Expand contact station/ticket sales/storage 500sf	$39,300	$7,500	$46,800
Subtotal	$1,673,918	$319,450	$1,993,368
Total Construction Costs	$3,508,326	$669,528	$4,177,853
Total Capital Cost			$4,737,853

Resource Management (Natural and Cultural)

Introduction. Some of the resource management actions that apply directly to issues within the GMP are outlined briefly in the following text. The Resource Management Plan for Rainbow Bridge National Monument is included as Appendix C of this proposal. The RMP project statements are constantly being updated to reflect any changing protection issues. At the present time topics for natural resource project statements include: compile baseline natural resource inventory; monitor and protect endangered species; develop a vegetation management plan; develop a geographic information system (GIS); control exotic plants; develop an integrated pest management plan (IPM); monitor riparian habitat; monitor stability of Rainbow Bridge; monitor erosion and hazardous rockfall areas; secure water rights for the monument; eliminate multiple trails; rehabilitate areas of soil compaction; develop a hazardous spill program; monitor water quality; conduct sound monitoring study; develop an aircraft overflight plan; monitor native and alien vegetation; inventory and monitor aesthetic resources; protect and interpret resources. At the present time topics for cultural resource project statements include: remove graffiti - cyclic maintenance; prepare a special history study; prepare ethnographic studies; catalogue historic documents and photographs; prepare a scope of collections statement; prepare an administrative history; conduct rock art-historic inscription inventory; prepare ethnographic overview and assessment; preserve cultural landscape; monitor cultural resources; conduct archeological inventory of monument. No previous resource management plans have been approved for the monument.

Natural Resources.

Long-Term Structural Stability of the Rainbow Bridge. With the inundation of Lake Powell and the establishment of the Glen Canyon NRA, the structural stability of Rainbow Bridge became a major issue. Rainbow Bridge was monitored for stability by the Bureau of Reclamation (BOR) from 1974 to 1984. The BOR report issued in 1985 summarizing a ten year study indicated that no movement had been detected. Since this study, the BOR has continued the monitoring program with improved techniques.

Long-Term Monitoring of The Monument. Under the proposal, cooperation with the Bureau of Reclamation and long-term monitoring would continue.

Exotic Plant Management. Tamarisk (*Tamarisk ramosissima*), an exotic tree species, whose seed is widely dispersed by wind, threatens to change the character of the monument. This species in a mature state has the potential to influence the developing riparian communities in the monument. Also, it has the potential to alter the natural visual characteristics of the monument. (For additional discussion, see Affected Environment and Environmental Consequences, Vegetation, Visual Resources). Exotic plant management strategies would completely eradicate tamarisk through a removal program of burning, cutting, or treatment with herbicides. This will require an annual commitment as new plants germinate each year.

Human Impacts Management. Some areas of vegetation, off the designated path system, have been trampled by visitors. The existing trails are also heavily worn. Visitors use a network of paths and trails, established randomly from use, to view the monument area. Human impact management strategies proposed at the monument would increase staff for interpretation, enforcement and litter management; provide a low-impact trail; confine visitors to a low-impact trail system; prohibit off trail access to the monument, except permitted American Indian religious activities; completely remove graffiti and restore vandalized rock facing; and institute a rehabilitation program for impacted areas.

Rockfalls and Geologic Hazards. Exfoliating rocks falling from Navajo sandstone have created natural geologic hazard areas on the monument, which pose a safety threat to visitors. The water access through the narrow canyon entrance from the main part of Lake Powell is lined with vertical sandstone walls, which are potential geologic hazards. Large pieces of sandstone have been known to fall from the cliffs above into Forbidding and Bridge Canyon waters. Rockfalls, where the existing dock abuts the shore, pose a potential threat to the safety of visitors. There is a potential for serious injury or death in the monument area as a result of falling rocks. Strategies to minimize the threat to visitors would move existing signs and interpretive area away from the rockfall area; locate all structures, docks, and trails away from rockfall areas to the maximum extent possible; and inform visitors of the hazards before they enter the monument area. During the period of seasonal closure to private boats, visitors would be informed by the boat operator during the 10-minute shuttle trip to the monument. During the off-season, visitors would be informed by signs at the monument dock. Also, the Bureau of Reclamation would continue to perform annual rockfall inspections and the National Park Service would periodically authorize the reduction of high rockfall hazard areas.

The NPS recognizes the geologic hazards of the area surrounding the Rainbow Bridge. It cannot eliminate all hazards of the area. It can, however, help to minimize accidents by proceeding to implement the two items above.

Flash Floods. A Flash Flood Mitigation Plan and discussion of alternatives are presented in Appendix D of this document. The appendix outlines safeguards that provide prudent measures to minimize risks to the visitor from flash flooding.

There are four components of the Flash Flood Mitigation Plan--a wayside exhibit, additional signing, evacuation and emergency preparedness procedures and a warning system. Wayside exhibit information would be provided that would greatly reduce the flash flood hazard to visitors. An eye-catching wayside would be added. Additional signs would be added telling visitors in the flood hazard zones where to move in case of a flood. Evacuation and emergency preparedness measures would be identified for the monument. A chain of command and responsibilities for specific actions would be identified. Emergency supplies would be stored at Dangling Rope and Rainbow Bridge. Supplies needed, their exact locations, and any necessary support facilities would be identified. Under the proposal, a warning system that provides at least five minutes warning would be installed. With this time visitors could be expected to be evacuated to areas of safety. Visitors would be alerted to evacuate by sirens and flashing lights at the dock and appropriate signing at land trails within the monument. Ranger assistance would help insure an expedient evacuation and greater assurance of success. For a more detailed discussion of the elements of Flash Flood Mitigation see Appendix D.

Noise Management. There are three types of noise associated with the monument - noise from visitor activities, aircraft, and boats. *Visitor Noise.* Each year thousands of visitors are funneled from dispersed recreation areas on Lake Powell to the confined 2,000-linear-foot walkway system at Rainbow Bridge. Management of this concentrated use requires a different strategy than that used at Glen Canyon NRA. The proposal addresses this problem in two ways. First, visitation will be limited to the monument's carrying capacity in both phases, thus limiting noise and overcrowding. Second, interpretation would be utilized to inform visitors that the monument is special, one held sacred by the Navajo, and a unique natural wonder. The interpretive program would attempt to convey reverence for the uniqueness of Rainbow Bridge, help set it apart from the recreation area, and promote respect for it among visitors. Both phases of the plan offer increased opportunities for the NPS to convey its message. *Aircraft Overflights.* There are occasional aircraft overflights of the monument. These overflights have been flown at 400-2,500 feet above ground level. Aircraft overflights create excessive noise and can interfere with visitor experience and appreciation of the monument. Noise management strategies would provide continued cooperation with the FAA and the U.S. Air Force for enforcement of altitude regulations; and continued monitoring of aircraft noise impacts. *Boat Noise.* Phase I of the proposal would manage boating noise by limiting use to carrying capacity limits. Phase II would dramatically reduce boating noise levels by prohibiting all private boats during the visitor season.

Unique, Rare, and Endangered Species Management. The monument would continue to be monitored for the presence of threatened and endangered plant and animal species. If any such species are found to exist, appropriate mitigation measures would be determined and implemented.

Cultural Resources.

Maintenance of Cultural Resources Sites. Cultural resources sites recorded in the monument area are being disturbed and damaged through unrestricted access by visitors. Visitors climb, touch, and debase petroglyphs with graffiti on canyon walls, causing some to have become degraded. Cultural site maintenance management would restrict visitor access to the defined low-impact trail; and provide maximum interpretation and enforcement via ranger presence during normal hours of operation at the monument.

Maintenance of American Indian Access to the Rainbow Bridge National Monument. Access to the monument by American Indians for cultural and religious purposes has been allowed in the past. Memorials to American Indians have been placed in locations that are not appropriate. Access to the monument by American Indians for religious reasons would be allowed by permit. Memorials would be located in an appropriate interpretive area so they can be viewed and appreciated by all visitors. Review/approval of the Director of the National Park Service would be required before the permanent placement of memorials could be placed in the monument area. The monument would be closed to the public on one day during the year to recognize American Indians. The day would be determined by the superintendent and the monument closed by his order. No development would be permitted underneath the bridge. Information would be made available to local chapter houses on the exact hour that the monument would be open for operations.

Mitigation to be Included Under the Proposal

All areas not previously surveyed would be examined for cultural remains by qualified archeologists. Because of previous disturbance of the area, it is probable that no significant resources would be found. However, before any land-modifying activity, a qualified archeologist would inspect the ground surface of the proposed development site and the immediate vicinity for the presence of cultural remains, both prehistoric and historic. All sites located would be evaluated for their National Register (NR) significance. Should newly discovered or previously unrecorded significant cultural remains be located, additional investigations would be accomplished before earth-disturbing activities took place. Archeological data recovery investigations would be performed in those areas where significant cultural remains would be affected by the actions of the proposal. In those areas where subsurface remains appear likely, an archeologist would be present to monitor land-modifying actions.

Future Planning Needs

This proposal contains an estimated cost for construction of housing facilities and utility upgrades at Dangling Rope. A separate environmental assessment as well as development concept plan revision would be needed at Dangling Rope to complete the management action outlined in this proposed plan.

Additionally, current ease of water access from Lake Powell is the primary determinant of levels of use within the monument. The Bureau of Reclamation is initiating an environmental impact study of existing operations for the Glen Canyon Dam. The effects that fluctuating water levels of Lake Powell have on use at the monument needs to be part of that study.

ALTERNATIVE A

Summary of the Alternative

The intent of this alternative is to accommodate increasing levels of visitor use to Rainbow Bridge with some reduction in visitor/visitor conflicts and visitor/resource conflicts. This alternative would provide less management controls over visitor activities than the proposal and provide a less structured visitor experience. This responds to some of the planning issues, but not all.

The alternative provides some specific advantages to park management. Within the monument boundary, the alternative would cost the least of all alternatives considered and have the least amount of development. It would provide visitors with the most individual freedom of action. In the view of park management, however, it would not solve some of the recurring problems associated with Rainbow Bridge, previously identified in the Issues section of the first chapter.

Within the water access channel leading to Rainbow Bridge NM, the alternative would provide some management over boating by establishment of a wakeless zone, but would not regulate the number of boats allowed in Forbidding and Bridge Canyons at any one time. The number of people allowed at the monument would be limited to the monument dock capacity for boats, with a modest expansion.

Specifically, the alternative would respond to the planning issues identified during the course of this plan as follows:

Quality Visitor Experience. The alternative would accommodate increasing levels of visitor use with some reduction in visitor/visitor and visitor/resource conflicts. The alternative would provide less management controls over visitor activities than the proposal and provide a less structured visitor experience. Visitor/visitor and visitor/resource conflicts would probably not be substantially reduced under this alternative.

Protection of Natural and Cultural Resources. Natural Resources would be protected. The alternative would provide for management zoning. Signing would be added requesting visitors to stay on trails. The existing trail would be improved and retained. Litter containers would be placed where needed. Eroded areas impacted by visitor use would be rehabilitated. Graffiti would be removed and the area would be rehabilitated. Noise from aircraft overflights would be monitored. Tamarisk would be selectively removed in areas where it would interfere with viewing of the bridge by visitors. The existing livestock fence would be improved. The NPS would continue to cooperate with the Bureau of Reclamation to monitor the long-term stability of the Rainbow Bridge. The BOR would continue to perform annual rockfall inspections. The National Park Service would authorize a program for periodic reduction in rockfall risk. Visitors would be informed on the rockfall hazard of Rainbow Bridge and moved through existing rockfall areas as quickly as possible. Existing signs and interpretive areas would be located as far away as possible from rockfall areas. Water quality would be monitored and the area would be equipped for spill containment. Threatened and endangered species would continue to be monitored. A flash flood monitoring plan would be implemented and an accompanying alarm system would be installed. The monument would be closed should conditions be favorable for flash floods.

Cultural resources would be protected. Signing would be added requesting visitors to stay on trails. Staff for some additional interpretation and enforcement would be increased. American Indians would be allowed on restricted areas of the monument for religious reasons, by permit. The alternative would provide some additional staff for the interpretation of cultural resource themes mentioned in Appendix B - Interpretive Prospectus. Existing memorials would be relocated to appropriate interpretive areas. The monument would be closed to the general public for one day a year for American Indians. The day would be designated by the superintendent. Hours of operation of the monument would be posted in the local Indian chapter houses. No development would occur directly underneath the bridge.

Access to Rainbow Bridge. A wakeless zone would be enforced from the narrows to the monument for all boats. No other restrictions would apply.

Interpretive Themes, Services, and Facilities. Themes include Geological Processes that Formed Bridge, Rainbow Bridge: Part of the Larger Colorado Plateau Ecosystem, People Have Interacted with the Bridge in Historic Times, and Human Activity's Impact on the Monument. There would be three primary areas of interpretive services - wayside exhibits, personal services and printed material. This alternative would rely most on printed material for presenting interpretation.

Facilities and Services. Facilities are broken down into two areas: facilities at the monument dock and on land at the monument. The existing dock would be expanded to provide a dock capacity for 30 private boats and 2 tour boats at one time (32 BAOT), with an estimated capacity not to exceed 390 PAOT. A small floating interpretive platform would be constructed to provide visitors a water view of Rainbow Bridge. The existing restroom would be improved. A small moveable dock connection to land would be constructed to help adjust to fluctuating lake levels.

The existing trail would be graveled with some spot widening to a viewing point south of the bridge. The existing land access trail would be maintained from the hardened congregating area to the monument boundary.

The total number of people who could be accommodated at one time would be restricted to the capacity of the slightly expanded monument dock or approximately 390 PAOT. This assumes a dock capacity for 30 private boats and 2 tour boats at one time and is approximately the same as the capacity of the monument - 390 PAOT. Concession tour boat use would be set at 195 PAOT.

General Development

Introduction. Development for the alternative is broken down into two categories: development for water-based access and land development at the monument. The reader should refer to Water Access-Alternative A and Alternative A maps when reviewing the text for the proposed general development.

Water Access. In this alternative, concession tour boats from Bullfrog/Wahweap would be limited to 195 persons at one time. Limits on numbers of private boats accessing the monument would be managed by the size and capacity of the monument dock.

Wakeless Zone. Under this alternative, a wakeless zone would be established for all boats from the narrows to the monument. A patrol boat would be needed for increased enforcement in the canyon. There would be no other restrictions on private boating within the channel.

Monument Capacity. Under this alternative, the dock capacity would be expanded to meet the monument capacity. The capacity for the monument is set not to exceed 390 persons at one time. This is based on a design providing a monument dock/trail system (2,200 linear feet). This also includes the capacity of a floating dock interpretive platform and the hardened congregating area. Under this alternative, there would be no way of scheduling visitors in private boats.

Monument Dock. Under this alternative, the existing dock would be expanded to accommodate a total of 30 private boats and 2 tour boats. The restroom would be improved. The dock area and restroom facility would be color-coordinated during modifications. The dock would be realigned so that it was in the middle of the channel and as far away from existing rockfall areas as possible. Tour boat and public boat docks would be separated. The existing toilet would be relocated so it did not block initial visitor views of Rainbow Bridge.

Permanent Floating Interpretive Platform. This would be handled the same as under the proposal.

Land Development at the Monument. Land development at the monument consists of retaining and graveling the existing trail with some spot widening.

Improved Trail. This alternative calls for constructing an improved gravel trail. Some spot widening would occur. The trail would be carefully molded to the natural contours and fit the character of the existing landscape. There would be no land access for disabled visitors. Access for disabled visitors would be limited to the floating interpretive platform.

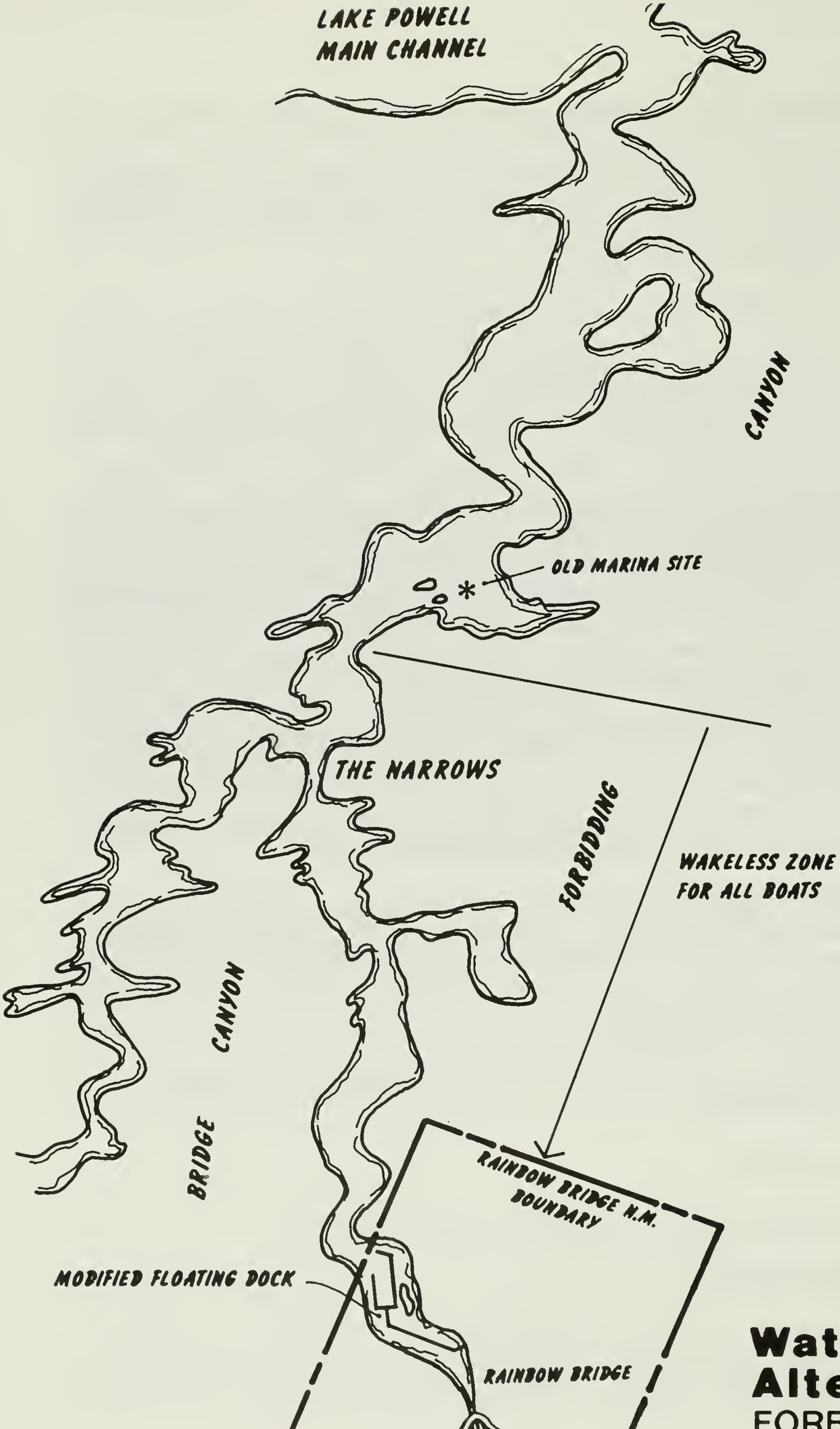
Existing Land Trail. This trail would be retained. Some eroded areas along the trail would be rehabilitated.

Land Use and Management

Land use and management would be the same as under the proposal.

Visitor Use and Interpretation

Introduction. Because the least time would be spent and available for presenting interpretive services under this alternative, the alternative would rely on printed material and wayside exhibits to transmit messages to the public. There would be only one area for wayside exhibits.



Water Access Alternative A

FORBIDDING CANYON

RAINBOW BRIDGE
NATIONAL MONUMENT

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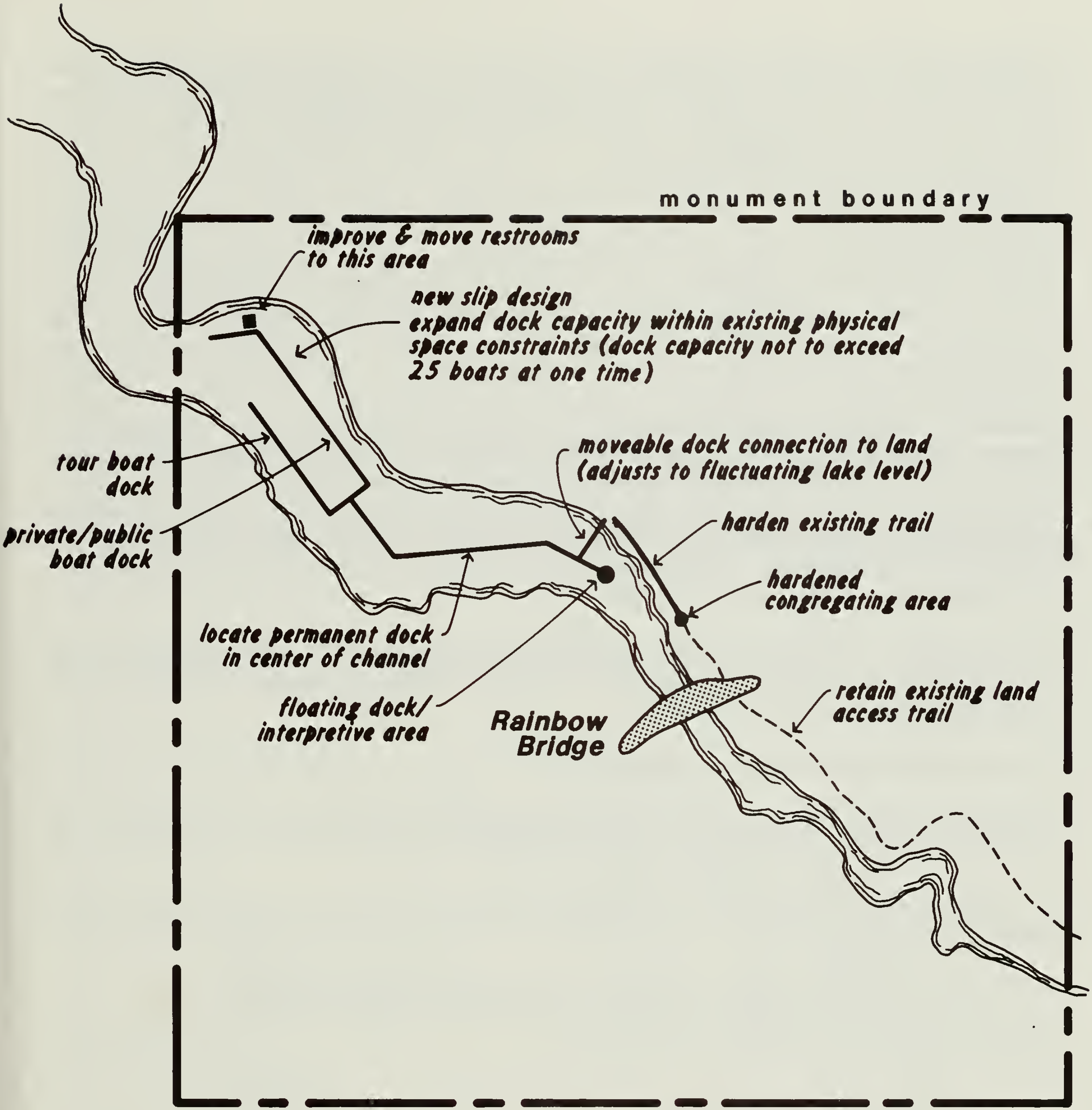

monument boundary
improve & move restrooms to this area
new slip design
expand dock capacity within existing physical space constraints (dock capacity not to exceed 25 boats at one time)
tour boat dock
private/public boat dock
moveable dock connection to land (adjusts to fluctuating lake level)
harden existing trail
hardened congregating area
locate permanent dock in center of channel
floating dock/ interpretive area
Rainbow Bridge
retain existing land access trail

Alternative A

Rainbow Bridge National Monument

U.S. Dept. of the Interior – National Park Service

Interpretation and Visitor Services. The interpretive themes for this alternative would be the same as under the proposal. The goals for the interpretation under the alternative are the same as for the proposal. Objectives would be the same as under the proposal, but would be more difficult to achieve. Of the visitors leaving the monument, the objective for interpretation would be to have at least 40 percent confirm that they received adequate information for a well informed, safe, efficient, and enjoyable visit; be able to describe the primary resource that warrants the area's national monument designation; know that the Rainbow Bridge is sacred to neighboring Indians; be able to identify water erosion and fracturing as the two main factors in the formation of Rainbow Bridge; be able to identify at least one management measure used to reduce impacts on the monument's resources; be able to identify at least one action they can perform to maintain water quality both within the monument and in the Glen Canyon National Recreation Area; and be able to identify Rainbow Bridge as a part of the Colorado Plateau. Twenty-five percent would be able to identify at least one action they can perform to prevent degradation to the Rainbow Bridge; know that prehistoric people once lived in and around the monument and that physical evidence of their culture lies within eyesight of the bridge; be able to identify at least one action they can perform to prevent degradation to archeological resources both within the monument and in the Glen Canyon National Recreation Area; and be able to describe at least one factor that may influence air quality in and around the monument.

Concessions. Scheduling of tour boats would be coordinated with the concessioners to insure that use does not exceed the carrying capacity allocated to concession operations (195 persons at one time).

Park Operations and Development Costs

Operations and Maintenance. For this alternative, all operations and maintenance would be completed by the National Park Service.

Facilities for housing would be built at Dangling Rope and maintained by the National Park Service for employees.

NPS staffing levels required to implement this alternative are as follows:

Maintenance:

Additional courtesy docks	
Floating interpretive platform	
Litter pick-up/trail maintenance	
Tamarisk eradication	
Flash flood monitoring	
Graffiti removal	1.0 FTE
Increased needs at Dangling Rope	
Housing/utilities	1.0 FTE
Subtotal	2.0 FTE

Resource Management:

Tamarisk eradication/graffiti removal	
Vegetation rehabilitation	1.0 FTE
Subtotal	1.0 FTE

Visitor Services:

Increased interpretation/protection	2.1 FTE
Wakeless enforcement in the channel	1.5 FTE
Subtotal	3.6 FTE
TOTAL	6.6 FTE

Estimated annual operations and maintenance budget associated with this alternative is $148,341 for salary and $ 98,894 for supplies, for a total of $247,235.

Development Cost. The total costs as well as phased implementation of this alternative are shown in Table 1b.

Table 1b

ALTERNATIVE A - MINIMUM MANAGEMENT

Equipment Costs	
Small patrol boat 3	$105,000
Total Equipment Costs	$105,000

Item	Gross Construction Costs	Advance & Proj. Plng. Costs	Total Project Costs
Phase I			
Implement flash flood mitigation	$91,700	$17,500	$109,200
Construct floating platform 1,600 sf	$125,760	$24,000	$149,760
Construct moveable dock/land section 200lf	$157,200	$30,000	$187,200
Improve land trail with spot graveling 2,100 lf	$23,973	$4,575	$28,548
Subtotal	$398,633	$76,075	$474,708
Phase II			
Rainbow Bridge			
Expand capacity of existing dock w/new slip design add 10 slips(240 sf ea.)	$188,640	$36,000	$224,640
Interpretive signs 4	$3,930	$750	$4,680
Dangling Rope			
Construct 2-6 person dorm 1,400 sf ea	$311,780	$59,500	$371,280
Upgrade utility system	$327,500	$62,500	$390,000
Subtotal	$831,850	$158,750	$990,600
Total Constuction Costs	$1,230,483	$234,825	$1,465,308
Total Capital Cost			$1,570,308

Resource Management (Natural and Cultural)

Introduction. Resource management actions are outlined briefly for this alternative within the following text.

Natural Resources.

Long-Term Structural Stability of the Rainbow Bridge. Management actions would be the same as under the proposal.

Exotic Plant Management. Exotic plant management strategies proposed at the monument area would use park staff to monitor the extent of the tamarisk growth and recommend implementation of a selective removal program.

Human Impacts Management. Human impact management strategies proposed at the monument would provide additional signs instructing visitors to stay on the trails; increased staff for interpretation, enforcement and litter management; would gravel the existing trail with spot widening; add litter containers; prohibit off-trail access to the monument, except for permitted American Indian religious activities; and remove graffiti and rehabilitate impacted areas.

Rockfalls and Geologic Hazards. Under this alternative, strategies to minimize the threat to visitors would be the same as under the proposal.

Noise Management. There are two types of noise associated with the monument - noise from visitor activities and noise from aircraft. *Visitor/Visitor Noise.* Under the alternative additional staff using interpretation would be used to reduce visitor/visitor conflicts. *Aircraft Overflights.* Under this alternative aircraft overflights would be monitored.

Unique, Rare, and Endangered Species Management. Under this alternative, management actions would be the same as under the proposal.

Cultural Resources.

Maintenance of Cultural Resources Sites. Cultural site maintenance management would provide additional signing for visitors, instructing them to stay on the trails; and provide additional interpretation and enforcement.

Maintenance of American Indian Access to the Rainbow Bridge National Monument. Access to the monument by American Indians for cultural and religious purposes has been allowed in the past. Memorials to famous American Indian leaders have been placed in locations that are not appropriate. American Indian access management under this alternative would provide some additional interpretation of cultural themes; allow permitted access to the monument by American Indians for religious reasons; locate memorials in an appropriate interpretive area so they can be viewed and appreciated by all visitors; and provide assistance and require review/approval of the Director prior to permanent placement of memorials in the monument area. The monument would be closed to the public on one day during the off-season each year to recognize American Indians. The day would be determined by the superintendent and closed by his order. Information would be made available to local chapter houses on the exact hour that the monument would be open for operations.

ALTERNATIVE B

Summary of the Alternative

The intent of this alternative is to accommodate increasing levels of visitation to Rainbow Bridge with a moderate amount of management, while providing a moderate reduction in visitor/visitor conflicts and visitor/resource conflicts. This alternative responds to some of the planning issues but not all.

The alternative provides some specific advantages to park management. This alternative removes boating activity and boating noise from the monument. It provides for reduced noise from boats. It provides a mix of individual visitor freedom and visitor management. Because of the length of the walkway, it has the highest monument carrying capacity. Consequently the monument, under this alternative, could accommodate the most visitors at one time. It would not, however, solve some of the recurring problems associated with Rainbow Bridge previously identified in the Issues section of the first chapter.

Within the water access channel leading to Rainbow Bridge NM, this alternative would provide some management of boating by establishment of a wakeless zone. Although it would provide a floating contact station, which would be used to improve channel safety and possibly charge entrance fees, the alternative would not regulate the number of boats allowed in Forbidding and Bridge Canyons at any one time. The number of people at the monument would be limited to the new monument dock/trail capacity.

This alternative seeks to manage noise and visitor activities, while still allowing the visitor some individual freedoms at the monument. By removing the constant source of boat noise, separating the unloading/boat area from the monument visitors, and providing some entrance controls, this alternative seeks to change visitor attitudes, perceptions and behavior. Management of noise and inappropriate visitor activities is achieved through separation of functions. The alternative calls for constructing a new entrance dock just outside the existing monument boundary. Its construction uses an existing land form to help segregate the unloading area from the visitors at the monument. The landform separates the areas visually and also offers some sound reduction. The construction of an entrance interpretive area is used to help prepare visitors for the special place they are entering.

Specifically, the alternative would respond to the planning issues identified as follows:

Quality Visitor Experience. This alternative accommodates increasing levels of visitor use at Rainbow Bridge with a moderate reduction of visitor/visitor and visitor/resource conflicts. Boating noise and visual intrusion of development would be reduced in the monument, however the problems of congestion and noise in the access channel would not be completely addressed.

Protection of Natural and Cultural Resources. Natural Resources would be protected. The alternative would provide for management zoning. Visitors would be confined to a low-impact hardened trail system. The existing land trail would be retained. Litter containers would be placed where needed. Eroded areas impacted by visitors would be rehabilitated. All graffiti would be removed and the area would be rehabilitated. A permit system for land access would be initiated if needed. To respond to noise from aircraft overflights, the proposal would seek increased enforcement of altitude regulations, and would monitor overflights. Tamarisk would be selectively removed in areas where in would interfere with viewing of the bridge by visitors. The existing livestock fence would be improved. The NPS would continue to cooperate with the Bureau of Reclamation to monitor the long-term stability of the Rainbow Bridge. The BOR would continue to perform annual rockfall inspections. The National Park Service would authorize periodic reduction in rockfall risk. Visitors would be informed of the rockfall hazard of Rainbow Bridge and moved through existing rockfall areas as quickly as possible. Existing signs and interpretive areas would be located as far away as possible from rockfall areas. Water quality would be monitored and the area would be equipped for spill containment. Threatened and endangered species would continue to be monitored. A flash flood monitoring plan would be implemented and an accompanying alarm system would be installed. The monument would be closed when conditions are favorable for flash floods.

Cultural resources would be protected. Visitors would be restricted to the low-impact hardened trails. Additional staffing would provide increased interpretation and enforcement. American Indians would be allowed on restricted areas of the monument for religious reasons by permit. The alternative would provide some additional staff for the interpretation of cultural resource themes identified in the Interpretive Prospectus. Existing memorials would be relocated to appropriate interpretive areas. The monument would be closed to the public for one day a year for American Indians (during the off-season). The day would be designated by the superintendent. Hours of operation of the monument would be posted in the local Indian chapter houses. No development would occur directly underneath the bridge.

Access to Rainbow Bridge. A wakeless zone would be enforced from the narrows to the monument for all boats (see Water Access Alternative B, Forbidding Canyon map). No other restrictions would apply.

Interpretive Themes, Services, and Facilities. Themes include Geological Processes that Formed Bridge, Rainbow Bridge: Part of the Larger Colorado Plateau Ecosystem, People have Interacted with the Bridge in Historic Times, and Human Activity's Impact on the Monument. There would be three primary areas of interpretive services - wayside exhibits, personal services and printed material. The alternative would not have a captive audience for interpretation nor as long a time to present the message as the proposal.

Facilities and Services. Facilities are broken down into two areas: facilities at the monument dock and on land at the monument. The existing dock would be expanded to provide a dock capacity for 40 private boats and 2 tour boats at one time (42 BAOT) with an estimated capacity not to exceed 480 PAOT. A small floating interpretive platform would be constructed to provide visitors a water view of Rainbow Bridge. A floating contact station would be provided at a location inside of Forbidding Canyon. A new restroom and storage facility would be provided. A small moveable dock connection to land would be constructed to help adjust to fluctuating lake levels.

A low-impact hardened trail would be constructed on land to a hardened congregating area. The existing land access trail would be maintained from the last hardened congregating area to the monument boundary. The area under Rainbow Bridge would be retained in a natural condition.

The total number of people who could be accommodated at one time would be restricted to the capacity of an expanded monument dock/trail or approximately 480 PAOT. This assumes a dock capacity for 40 private boats and 2 large boats at one time.

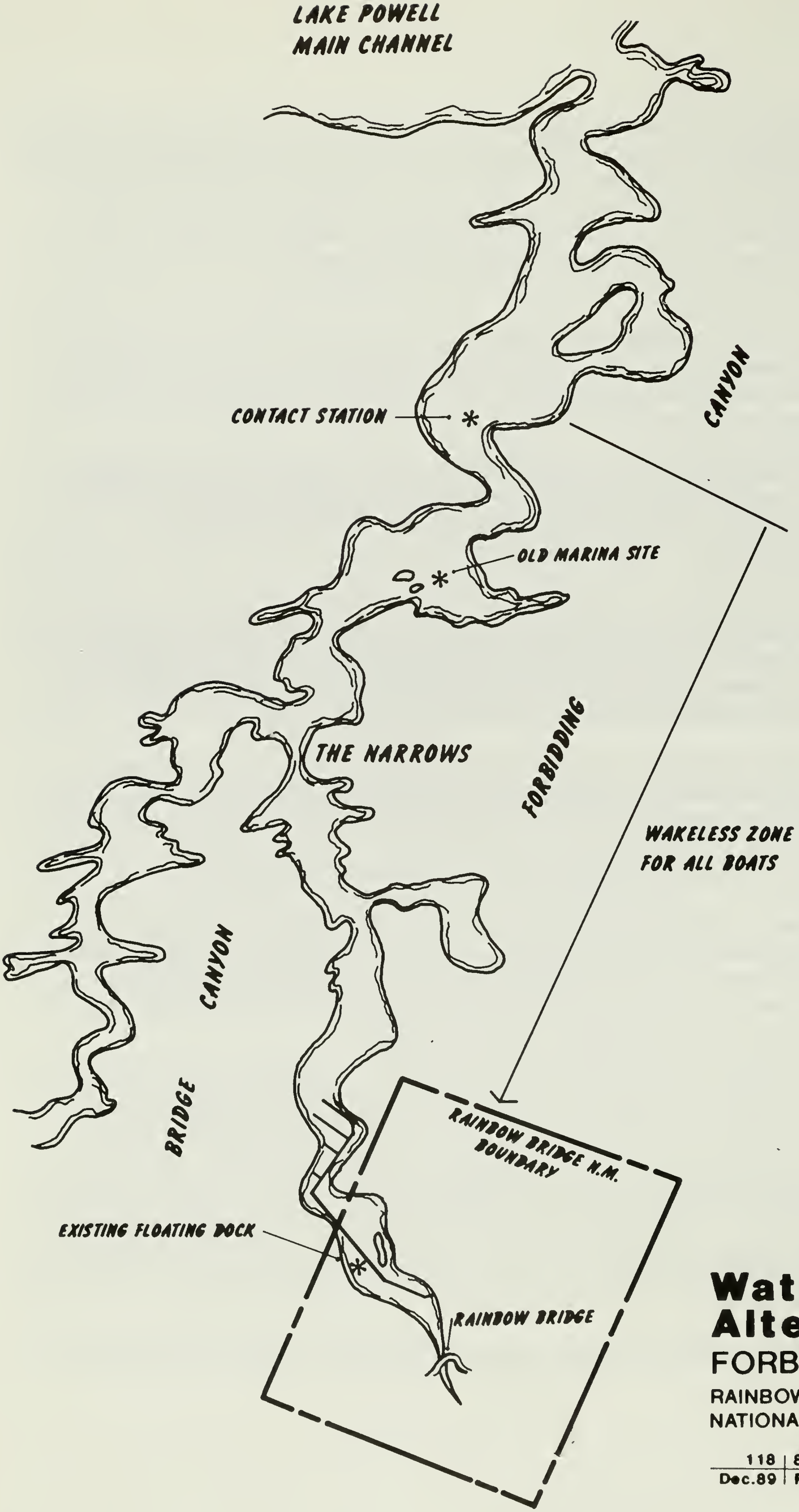
General Development

Introduction. Development for the alternative is broken down into two categories: development for water-based access and land development at the monument. The reader should refer to Water Access Alternative B, Forbidding Canyon and Alternative B maps, when reviewing the text for the proposed general development.

Water Access. In this alternative, a floating contact station would be constructed in Forbidding Canyon to provide visitor information, to insure that boat operators slow down to a wakeless speed, and would provide an area from which to charge entrance fees.

One NPS patrol boat would patrol the canyon to enforce these restrictions.

> **Wakeless Zone.** Under this alternative, a wakeless zone would be established for private boats from the narrows to the monument dock and a wakeless zone for tour boats from the mouth of Forbidding Canyon to the monument. A patrol boat would be needed for increased enforcement in the canyon. There would be no other restrictions on private boating within the channel.
>
> **Monument Capacity.** Under this alternative, the dock capacity would match the monument capacity. The capacity for the monument would be set not to exceed 480 persons at one time. This is based on a design providing a monument dock/trail system of 2,600 linear feet. This also includes the capacity of a floating dock interpretive platform and two congregating areas. Based on the carrying capacity coefficient of .151 PAOT/linear feet and the capacity of each congregating area (see Appendix A), it is estimated that the area can handle about 480 visitors at one time. Under this alternative, there would be no way of scheduling visitors in private boats.
>
> **Monument Dock.** Under this alternative, the existing dock would be reconfigured

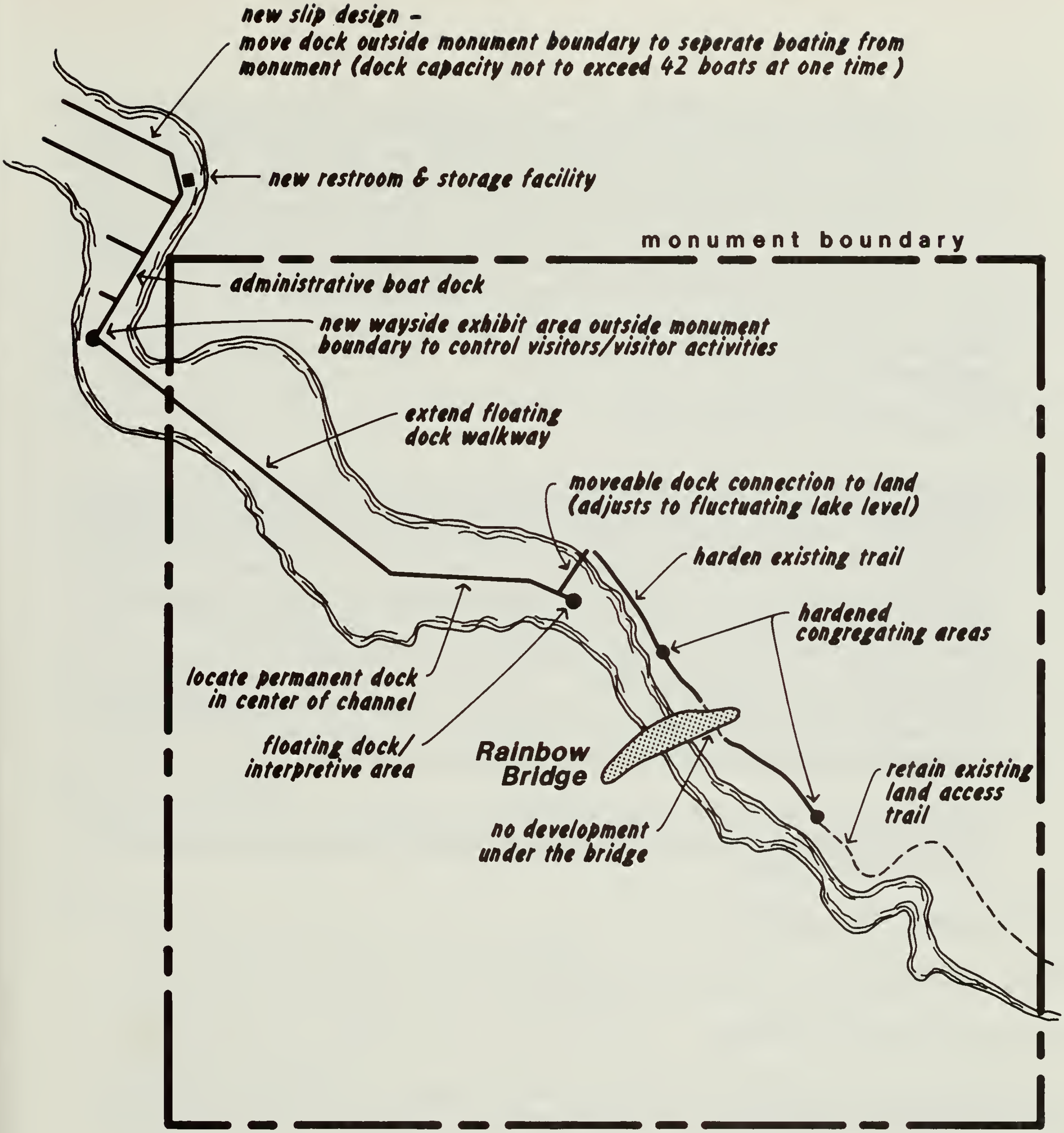


Water Access Alternative B

FORBIDDING CANYON

RAINBOW BRIDGE
NATIONAL MONUMENT

118 | 80,016
Dec.89 | RMRO


new slip design -
move dock outside monument boundary to seperate boating from monument (dock capacity not to exceed 42 boats at one time)
new restroom & storage facility
monument boundary
administrative boat dock
new wayside exhibit area outside monument boundary to control visitors/visitor activities
extend floating dock walkway
moveable dock connection to land (adjusts to fluctuating lake level)
harden existing trail
hardened congregating areas
locate permanent dock in center of channel
floating dock/ interpretive area
Rainbow Bridge
no development under the bridge
retain existing land access trail

Alternative B

Rainbow Bridge National Monument

U.S. Dept. of the Interior – National Park Service

118 | 80,013
Dec.89 | RMRO

and moved to provide 40 private boat slips and 2 large boat slips. A new restroom, added storage area, separate administrative dock, and bulletin board would also be provided. A wayside exhibit area would be constructed just outside the monument boundary. The dock area and restroom facility would be color-coordinated during modifications. The dock would be realigned to be in the middle of the channel and as far away from existing rockfall areas as possible. Tour boat and public boat docks would be separated. The existing toilet would be relocated so it did not block initial visitor views of Rainbow Bridge.

Permanent Floating Interpretive Platform. This is the same as under the proposal.

Land Development at the Monument.

Low-Impact Trail. The alternative calls for constructing a low-impact trail, following the existing trail alignment terminating at the congregating area south of the bridge. The trail would be carefully molded to the natural contours and fit the character of the existing landscape. The trail color and material would be coordinated to blend with the color of the existing Kayenta Sandstone. Access for persons with disabilities would be insured to the congregating area. No development would take place directly under Rainbow Bridge.

Low-Impact Congregating Area. This alternative calls for the construction of two 1,600-square-foot congregating areas. Each area would be large enough to accommodate 28 visitors at one time and interpretive displays.

Existing Land Trail. This trail would be retained from the last proposed congregating area to the monument boundary. Some eroded areas along the trail would be rehabilitated.

Land Use and Management

These would be the same as under the proposal.

Visitor Use and Interpretation

Introduction. Because of the long walkway, visitors' lengths of stay would increase and the alternative would rely most on personal services to deliver messages to the public. There would be four areas for wayside exhibits and group talks.

Interpretation and Visitor Services. The interpretive themes for this alternative would be the same as for the proposal. The goals for the interpretation under the alternative are the same as for the proposal. Objectives would be the same as under the proposal, but would be more difficult to achieve. Of the visitors leaving the monument, the objectives for interpretation would be to have at least 70 percent confirm that they received adequate information for a well informed, safe, efficient, and enjoyable visit; be able to describe the primary resource that warrants the area's national monument designation; know that the

Rainbow Bridge is sacred to neighboring American Indians; be able to identify water erosion and fracturing as the two main factors in the formation of Rainbow Bridge; be able to identify at least one management measure used to reduce impacts on the monument's resources; be able to identify at least one action they can perform to maintain water quality both within the monument and in the Glen Canyon National Recreation Area; and be able to identify Rainbow Bridge as a part of the Colorado Plateau. Forty percent would be able to identify at least one action they can perform to prevent degradation to the Rainbow Bridge; know that prehistoric people once lived in and around the monument and that physical evidence of their culture lies within eyesight of the bridge; be able to identify at least one action they can perform to prevent degradation to archeological resources both within the monument and in the Glen Canyon National Recreation Area; and be able to describe at least one factor that may influence air quality in and around the monument.

Concessions. Scheduling of tour boats would be coordinated with the concessioner. Boat tours would be limited to a total of 240 persons at one time or 50 percent of the total carrying capacity.

Park Operations and Development Costs

Operations and Maintenance. For the alternative, all operations and maintenance would be completed by the National Park Service. Dock security, fire, and EMS would be provided by the NPS.

Facilities for housing would be built at Dangling Rope and maintained by the National Park Service for employees.

NPS staffing levels required to implement this alternative are as follows:

Maintenance:

Contact station docks	1.5 FTE
Contact station water/sewer/trash/electric	
Additional courtesy dock and floating walkway	1.0 FTE
Floating interpretive platform	
Increased litter management, trail maintenance	
Tamarisk eradication	
Flood monitoring/alarm system	
Graffiti removal	0.6 FTE
Increased needs at Dangling Rope	
Housing and utilities (15 seasonals/3-6 persons dorms)	1.0 FTE
Subtotal	4.1 FTE

Resource Management

Tamarisk eradication/graffiti removal	
Vegetation rehabilitation	1.0 FTE
Subtotal	1.0 FTE

Visitor Services:	
Increased interpretation/protection	2.1 FTE
Wakeless enforcement in the channel	1.5 FTE
Fee collection/interpretation	2.0 FTE
(w/o fees)	(1.5 FTE)
Subtotal	5.6 (4.1)FTE
Administration:	
Fiscal Clerk (w/o fees)	0.5 (0) FTE
TOTAL	11.2 (9.2) FTE

Estimated annual operations and maintenance budget associated with this alternative is $251,730 for salary and $167,820 for supplies for a total of $419,550.

Development Cost. The total costs, as well as phased implementation of this alternative, are shown in Table 1c.

Resource Management (Natural and Cultural)

Introduction. Resource management actions are outlined briefly for the alternative in the following text.

Natural Resources.

Long-Term Structural Stability of the Rainbow Bridge. Management actions would be the same as under the proposal.

Exotic Plant Management. Exotic plant management strategies proposed at the monument area would be the same as for Alternative A.

Human Impacts Management. Human impact management strategies proposed at the monument would construct a new wayside exhibit at the monument entrance; increase staff for interpretation, provide enforcement and litter management; construct a low-impact hardened trail system; add litter containers; prohibit off-trail access to the monument except for permitted American Indian religious activities; and remove graffiti and rehabilitate impacted areas.

Rockfalls and Geologic Hazards. Under this alternative, strategies to minimize the threat to visitors would be the same as under the proposal.

Flash Floods. Under this alternative, strategies to minimize the threat to visitors would be the same as under the proposal.

Noise Management. There are three types of noise associated with the monument - noise from visitor activities, noise from aircraft, and noise from boats.

Table 1c

ALTERNATIVE B - INTERMEDIATE MANAGEMENT

Equipment Costs	
Patrol boats 5	$175,000
Total Equipment Costs	$175,000

Item	Gross Construction Costs	Advance & Proj. Plng. Costs	Total Project Costs
Phase I			
Implement flash flood mitigation	$91,700	$17,500	$109,200
Construct floating platform 1,600 sf	$125,760	$24,000	$149,760
Improve & maintain land access trail 900 lf	$10,480	$2,000	$12,480
Construct moveable dock/land section 200lf	$157,200	$30,000	$187,200
Subtotal	$385,140	$73,500	$458,640
Phase II			
Construct viewing area 1,600sf ea.	$9,170	$1,750	$10,920
Interpretive signs at 12	$11,790	$2,250	$14,040
Harden trail 1200 lf	$26,200	$5,000	$31,200
Construct informal gathering area under bridge 800sf	$62,880	$12,000	$74,880
Subtotal	$110,040	$21,000	$131,040
Phase III			
Rainbow Bridge			
Construct new dock outside monument boundary add 40 slips (240 sf ea.)	$754,560	$144,000	$898,560
Additional floating dock to monument boundary 15,000sf	$1,179,000	$225,000	$1,404,000
Construct wayside exhibit /kiosk	$35,370	$6,750	$42,120
Storage building/restroom 600sf	$47,160	$9,000	$56,160
Dangling Rope			
Construct 3-6 person dorm 1,400 sf ea	$467,670	$89,250	$556,920
Upgrade utility system	$327,500	$62,500	$390,000
Forbidding Canyon			
Floating contact station 5,000 sf	$393,000	$75,000	$468,000
Subtotal	$3,204,260	$611,500	$3,815,760
Total Constuction Costs	$3,699,440	$706,000	$4,405,440
Total Capital Cost			$4,580,440

Visitor/Visitor Noise. Under the alternative, the boat docking area would be physically separated from sight of the pedestrian area in the monument. The congestion and noise associated with the docks would be removed from the proximity of the bridge. In addition, the additional length of the floating walkway would offer opportunities for interpretive areas to prepare the visitor for their visit to Rainbow Bridge. *Aircraft Overflights.* Actions under this alternative are the same as under Alternative A. *Boat Noise.* Separation of the boat docking area from the monument will greatly decrease boating noise impacts.

Unique, Rare, and Endangered Species Management. Under this alternative, management actions would be the same as under the proposal.

Cultural Resources.

Maintenance of Cultural Resources Sites. Cultural site maintenance management would restrict visitors to the low-impact trail system and provide increased interpretation of cultural themes through additional signing and interpretive areas.

Maintenance of American Indian Access to the Rainbow Bridge National Monument. Access to the monument for American Indians for cultural and religious purposes has been allowed in the past. Memorials to famous American Indian leaders have been placed in locations that are not appropriate. American Indian access management would provide increased interpretation of cultural themes; allow permitted access to the monument by American Indians for religious reasons; locate memorials in an appropriate interpretive area so they can be viewed and appreciated by all visitors; and provide assistance and require review/approval of the superintendent before permanent placement of memorials in the monument area. The monument would be closed to the public on one day during the off-season each year to recognize American Indians. The day would be determined by the superintendent and the area closed by his order. Information would be made available to local chapter houses on the exact hour that the monument would be open for operations.

NO-ACTION ALTERNATIVE

Under this alternative, all the existing functions would be maintained as they are today. Natural and cultural resources, quality of many visitor services, and visitor experience at Rainbow Bridge would continue to deteriorate. Visitor dissatisfaction would increase with increasing visitation permitted without proper management. Conflicts among users would continue. The appearance of facilities would worsen. There would be no regulation of boats in the water access channel to Rainbow Bridge. Circulation would remain marginal and inadequate to handle increasing visitation.

This alternative describes current conditions as written in the Affected Environment and Environmental Consequences section. For a more detailed description of existing facilities and conditions, refer to this section.

No major new public or private investment in facilities would occur. For a more detailed discussion of existing uses, refer to the Planning Background and Issues sections of this document.

SUMMARY OF ALTERNATIVES

Item Description	Proposal	Alternative A	Alternative B	No-Action Alternative
Issue: Quality Visitor Experience	Accommodate increasing levels of visitor use to Rainbow Bridge while minimizing visitor to visitor and visitor resource conflicts.	Accommodate increasing levels of visitor use to Rainbow Bridge with some reduction in visitor/visitor and visitor/resource conflicts. Provide a less structured visitor experience.	Accommodate increasing levels of visitor use to Rainbow Bridge while providing a moderate reduction in visitor to visitor and visitor resource conflicts.	No change.
	Most management of visitors.	Least management of visitors.	Moderate management of visitors.	No management of visitor actions.
	Seasonal Shuttle with interpretation.	----	Physical separation of pedestrian docking area from boat activity.	---
	Increased interpretation and interpretive areas.	Increased interpretation.	Same as proposal.	----
Issue: Protection of Natural Resources	Management Zoning.	Same as proposal.	Same as proposal.	No Change.
	Confine visitors to trails.	Provide additional signing instructing visitors to stay on trails.	Same as proposal.	No Change.
	Increase Staff for interpretation, enforcement, & litter control.	Same as proposal.	Same as proposal.	No Change.
	Low-impact hardened trail.	Gravel trail with spot widening.	Same as proposal.	No Change.
	Additional litter containers.	Same as proposal.	Same as proposal.	No Change.
	Complete graffiti removal and rehabilitation of impacts on vegetation.	Remove graffiti and rehabilitate most impacted areas.	Same as proposal.	No Change.
	Permit system for land access if needed.	____	Same as proposal.	No Change.
	Increased enforcement of altitude regulations.	Monitor aircraft overflights.	Same as proposal.	No Change.
	Tamarisk completely eradicated.	Selectively remove tamarisk.	Same as Alternative A.	No Change.
	Monitor/cooperate with BOR on long term stability of Rainbow Bridge.	Same as proposal.	Same as proposal.	No Change.
	BOR continue to perform rockfall hazard inspections; NPS authorize periodic removal of rockfall; visitors moved through existing rockfall as quickly as possible; move existing signing and interpretation away from rockfall areas.	Same as proposal.	Same as proposal.	No Change.
	Water quality monitored/monument equipped for spill containment.	Same as proposal.	Same as proposal	No Change.
	T & E species monitored	Same as proposal.	Same as proposal.	No Change.
	Flash Flood Mitigation Plan implemented.	Same as proposal.	Same as proposal.	No Change.
Issue: Protection of	Restrict visitors to	Additional signing	Same as proposal.	No Change.

Cultural Resources	low-impact hardened trails.	instructingvisitors to stay on trail.		
	Permitted access on restricted parts of the monument for religious reasons.	Same as proposal.	Same as proposal.	No Change.
	Relocation of memorials to an appropriate interpretive area.	Same as proposal.	Same as proposal.	No Change.
	Provide maximum amount of interpretation and enforcement.	Provide increased interpretation and enforcement.	Provide some additional interpretation and enforcement.	No Change.
	One day for American Indians - Bridge closed to the public.	Same as proposal.	Same as proposal.	
	Hours of operation made available to the local Navajo chapter house.	Same as proposal.	Same as proposal.	
	No development under the bridge.	Same as proposal.	Same as proposal.	
Issue: Access to Rainbow Bridge and Visitor Safety	Phase I: Seasonal entrance station to control number of boats in the channel and charge entrance fees.	Increased enforcement in the channel.	Visitors required to stop at contact station. Enforcement of wakeless zones.	No Change.
	Phase II: Seasonal transportation shuttle system from Forbidding Canyon to the monument.			
	Wakeless zone during off-season.	Wakeless zone from the narrows to the monument for all boats.	Same as Alternative A	No Change.
Issue: Interpretive Themes, Services, and Facilities	Geological Processes, Larger Colorado Plateau Ecosystem, Man interaction with the bridge, Modern Man's Impact.	Same as proposal.	Same as proposal.	No Change.
	Provides three wayside exhibits, personal services, and printed material. Provides for a captive audience through shuttle transportation.	Provides one wayside exhibit, some personal service, and printed material. Would rely mostly on printed material and personal services.	Provides two wayside exhibits, personal services, and printed material. Would rely primarily on personal services with the opportunity for contact in the channel.	No Change.
Issue: Facilities and Services	Seasonal shuttle transportation system. Monument capacity - 390 PAOT. Monument dock capacity would be 30 BAOT. Transfer dock capacity 53 BAOT (includes 13 large boat slips).	Small modification to existing dock. Monument capacity - 390 PAOT and 30 BAOT.	Extended dock facility to outside monument boundary. Monument capacity - 480 PAOT and 42 BAOT.	No change to existing dock.
	Transfer dock: Indoor comfort station (chemically operated toilets). Visitor contact station. Natural History Association outlet. Wakeless zone off-season.	No dock or contact station in Forbidding Canyon Wakeless zone.	Contact station in Forbidding Canyon. Wakeless zone.	No Change. No wakeless zone.
	Monument dock: Floating platform, wayside exhibit, moveable dock section to adjust to fluctuating lake levels.	Monument dock: Same as proposal and increase existing dock capacity by 10 slips.	Monument dock: Expanded dock by 22 slips (2 slips for large boats), extend dock outside monument boundary, provide wayside ex-	No Change.

			hibit, floating platform, and moveable dock section to adjust to fluctuating water levels	
	At the monument: Hardened trail and congregating area. The area under Rainbow Bridge would be retained in a natural condition	At the monument: Spot widening and gravel trail. The existing land access trail maintained in its present condition from the congregating area to the monument boundary	At the monument: Same as the proposal	No Change.
	Tour boats utilization would be increased to 50% or 195 PAOT	Tour boat utilization would be increased to 160 PAOT	Tour boat utilization would be increased to 240 PAOT	No Change.
Capital Cost				
Equipment	$560,000	$105,000	$175,000	
Phase I Cost	$1,096,472	$365,508	$349,440	
Phase II Cost	$2,197,560	$878,280	$131,040	
Phase III Cost			$3,815,760	
Total Capital Cost	**$3,854,032**	**$1,348,788**	**$4,471,240**	
Yearly Operating Cost	NPS Operated Shuttle	NA	------	
FTE Cost	(23.2)	(6.6)	(11.2)	
Phase I	$251,730	$148,341	$251,730	
Additional Phase II Cost	$269,711			
Supplies				
Phase I	$167,820	$98,894	$167,820	
Additional Phase II Cost	$179,707			
Gas/Oil	$128,000	NA	NA	
Repair/Eng. Repl.	$138,600	NA	NA	
Total O&M Cost				
Phase I	$419,550			
Phase II	$716,018			
	$1,135,568	$247,235	**$419,550**	

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Rainbow Bridge National Monument is in southeastern Utah in San Juan County. Totaling 160 acres, the monument is bounded on three sides by the Navajo Indian Reservation and on one side by the Glen Canyon National Recreation Area. The Rainbow Bridge itself spans 84 meters (275 feet) and arches to a height of 88 meters (290 feet). The top is 13 meters (42 feet) thick and 10 meters (33 feet) wide at the narrowest point.

Rainbow Bridge is located in an unsurveyed portion of San Juan County, Utah. It is approximately 30 miles east-northeast of Page, Arizona, and about 6.5 miles north of the Arizona-Utah line. The precise location outlined in the proclamation that established the monument is as follows: "the southeast corner of the 160 acre tract is located N 60 degrees 25 minutes west from milepost 179 of the Arizona-Utah boundary a distance of 7 miles and 67 and 87/100 chains" (Taft 1910).

Primary access to the monument is by water through a thin tributary of Lake Powell. The Bridge Canyon water channel enters the monument area on the northwest corner of the boundary. There is also a trail across Navajo Mountain, which accesses the monument by land. Few visitors use the trail because of the length of time it takes to access the monument using the trail; usually more than a day, one way.

Weather and precipitation in the southwest is irregular. Precipitation averages about 7 inches (17.8 cm) per year with a range of 2.5 to 10 inches. Most precipitation is rain, falling in a two-season pattern -- late summer thundershowers and cool winter rains or snow. The thundershowers are a significant planning variable because they cause high surface runoff and flash floods in desert drainages. Flash flooding can occur in the Bridge Canyon area of the monument.

Strong, gusty, southerly winds are common from June through September, particularly in the afternoon, while light breezes are frequent between February and May. Windy conditions can exist in Bridge Canyon when prevailing winds come from the southeast. Winds also can be amplified within the canyon when wind direction is just right. Normally, however, the canyon walls offer some protection from wind gusts off the higher desert and scarps above. This can have an effect on both boats within the channel and docking facilities placed there.

Summer temperatures are high, average July maximums being 95 to 97 degrees Fahrenheit, with some record temperatures approaching 115 degrees. The average minimum winter temperature is 24 degrees Fahrenheit, with the record lows approaching 4 degrees. Surface water temperature of Lake Powell and the canyon tributary varies from approximately 79 degrees Fahrenheit in July, to a low of 44 degrees Fahrenheit in January. The canyon aspect can offer significant shading. In addition, water and the rock mass can create microclimates and modify temperature extremes. Left in the open, however, diurnal temperatures are significant -- a 30 degree range is common -- and the effect of intense sun during the summer is amplified by reflectivity from light-colored soils and water surface. In addition, shading and cooler microclimates from conditions described previously are important to visitor comfort.

EXISTING CONDITIONS AND DEVELOPMENT

Existing Resource Conditions

Existing conditions of natural resources have deteriorated within the monument because of increased ease of access by people using boats from Lake Powell. The issues described in the first chapter describe deteriorating conditions resulting from uncontrolled visitor use. Protection of natural resources has been lax and has resulted in vandalism and graffiti. Uncontrolled visitor use off of established trails has resulted in surface damage and trampled vegetation. In addition, tamarisk, spread along the shorelines of Lake Powell, grows along the shore inside the monument boundary. If left unchecked, it will eventually block the view of the Rainbow Bridge. See Existing Conditions map.

Existing Development

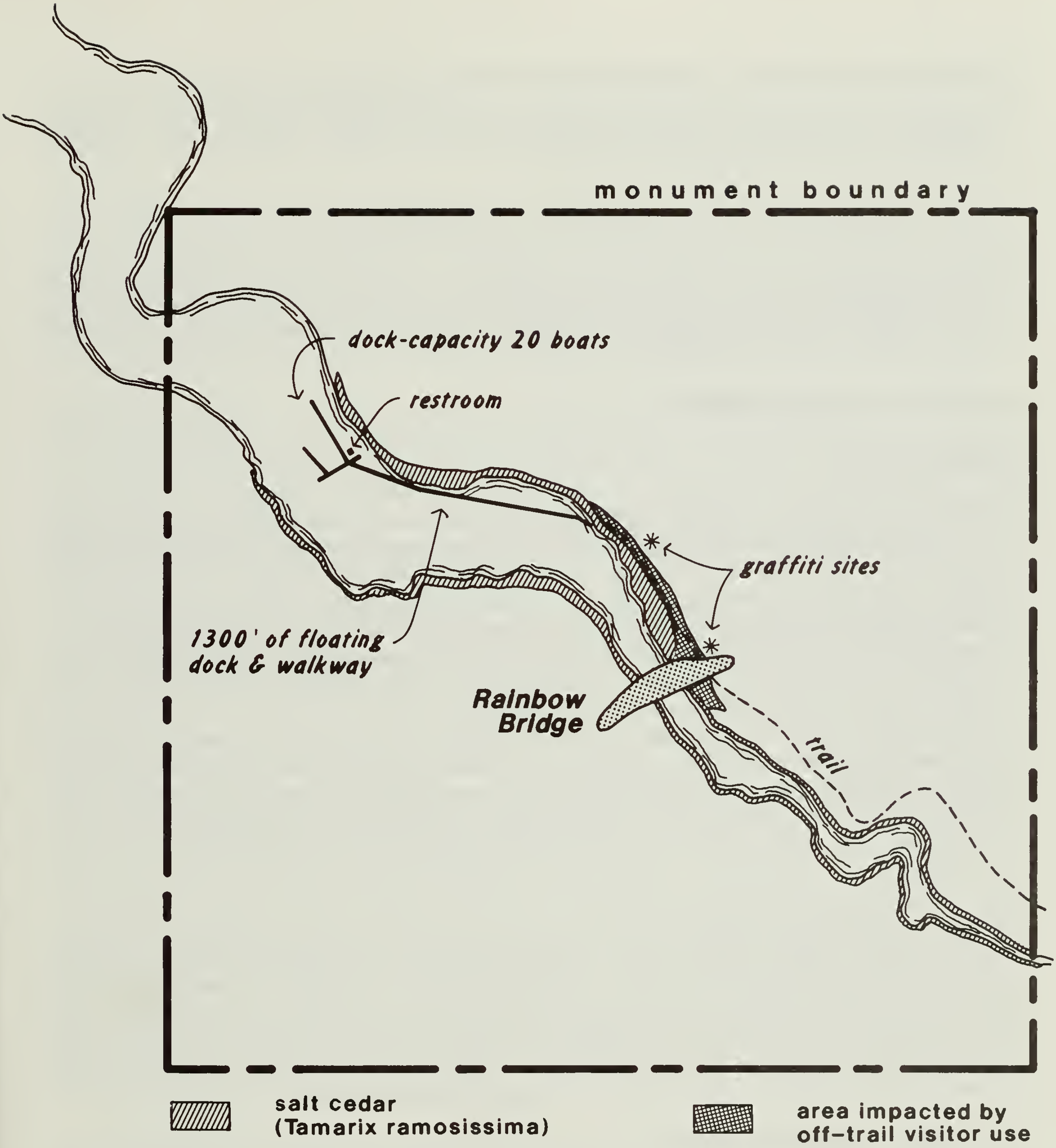
Facilities at Rainbow Bridge include 1,300 feet of floating dock walkway, a courtesy dock, a maintained trail, which is a 1/4-mile walk up the canyon to the bridge, and two interpretive rest areas along the trail. The existing boat dock can hold about 20 boats.

Three employees from the Glen Canyon NRA stationed at Dangling Rope--one ranger (.2), one interpreter (.8), and one maintenance person (.2)--spend part of their time at Rainbow Bridge NM.

LAND STATUS

The proposal includes land from two areas: Rainbow Bridge National Monument and Glen Canyon National Recreation Area. Land inside the monument is wholly owned by the United States.

Outside the monument boundary in Bridge and Forbidding Canyons, shoreline and water areas up to elevation 3,720 feet, are administered by Glen Canyon National Recreation Area, but are in a joint National Park Service and Navajo Tribe participation zone. In 1958, Pubic Law 85-868 (72 Stat. 1686) withdrew land from the Navajo Reservation for the Colorado River Storage Project. This land on the south and east side of Lake Powell, was formerly Navajo land. These lands are called Parcel "B" lands and are illustrated on Figure 1. Under a Memorandum of Agreement (MOA) signed in 1970, by the Bureau of Indian Affairs, the National Park Service, the Bureau of Reclamation, and the Navajo Tribe, the Navajo Tribe was granted preference rights to recreational facilities developed on Parcel "B" lands.


monument boundary
dock-capacity 20 boats
restroom
graffiti sites
1300' of floating dock & walkway
Rainbow Bridge
trail
▨ salt cedar (Tamarix ramosissima)
▩ area impacted by off-trail visitor use

Existing Conditions

Rainbow Bridge National Monument

U.S. Dept. of the Interior – National Park Service

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Dec.89 | RMRO

Impact of Alternative A, Alternative B, and the No-Action Alternative

There are no concession interests proposed under these alternatives. Therefore, preference rights would not be a concern.

Impact of the Proposal

Were a shuttle operation run by a concessioner, the Navajo Tribe would be given the right of preference in running the concession operation, as per the MOA described above. Were a shuttle operation run by the National Park Service, concession operations would not be involved with the proposal.

NATURAL RESOURCES

Geology/Soils

Geology, description. The topography of the canyons in the area of Rainbow Bridge is a direct result of the area's geology and the climatic environment discussed previously. Events that created Rainbow Bridge are described in *Archeological Survey in the Glen Canyon National Recreation Area, Year 1 Descriptive Report*, 1984-85, CHAPTER 2. "Meandering streams flowing from Navajo Mountain cut into the underlying bedrock. As downcutting progressed, boulders and gravels were deposited by Bridge Canyon Creek along the inside of the bends on the canyon, while faster water on the outside formed alcoves in the cliff walls. As the streams encountered the more erosion resistant Kayenta sandstone, the rate of downcutting diminished, and the stream's energy was concentrated on widening its channel. At one point a sharp meander created a loop around a narrow wedge of sandstone. Alcoves were eroded on opposite sides of this rock wedge. Eventually the rear walls of the alcoves were breached by the stream, the loop was abandoned, and water began flowing through the incipient arch. Continual downcutting and exfoliation resulted in the formation of the natural wonder known as Rainbow Bridge."

Geology at Rainbow Bridge is comprised of two sandstone formations--Kayenta and Navajo. The Navajo resides on top of the Kayenta formation. Both formations have low water permeability through their pores, so ground water circulation is controlled almost entirely by bedding planes, truncation planes, and joints. These provide a ready passage for water. The eccentric stream erosion exposes the Kayenta formation about halfway down the canyon wall. Seeps and springs are abundant. Hanging gardens are also prevalent, attracted to the microclimates provided between planes.

The Navajo sandstone consists of uniformly well-rounded quartz sand cemented with iron oxide and calcium carbonate. The rock is softer than Kayenta. In addition, relief joints in the Navajo formation produce exfoliation, releasing pressure, and rapidly removing rock by erosion. The formations are characterized by joint-controlled rockfall, predominating over weathering as the primary erosive process. Hence, there are areas of known rockfall within the monument boundary, which may have an effect on placement of facilities.

For the most part, the exposed portion of the underlying Kayenta formation has a high bearing strength and is resistant to erosion. Because of this, it often forms ledges, caps, platforms and benches, and can be considered fairly stable for construction purposes.

The monument is an example of geologic diversity and unquestioned national significance. As an outstanding example representing a major stage of earth's evolutionary history, Rainbow Bridge was nominated for status as a World Heritage Site. Geologic processes on view at the monument are wind and water deposition, consolidation, periods of deformation by folding, warping, and faulting, normal erosion, and accelerated erosion brought about by general uplift. The result of these processes is a river system deeply entrenched in the sedimentary rocks of the Colorado Plateau.

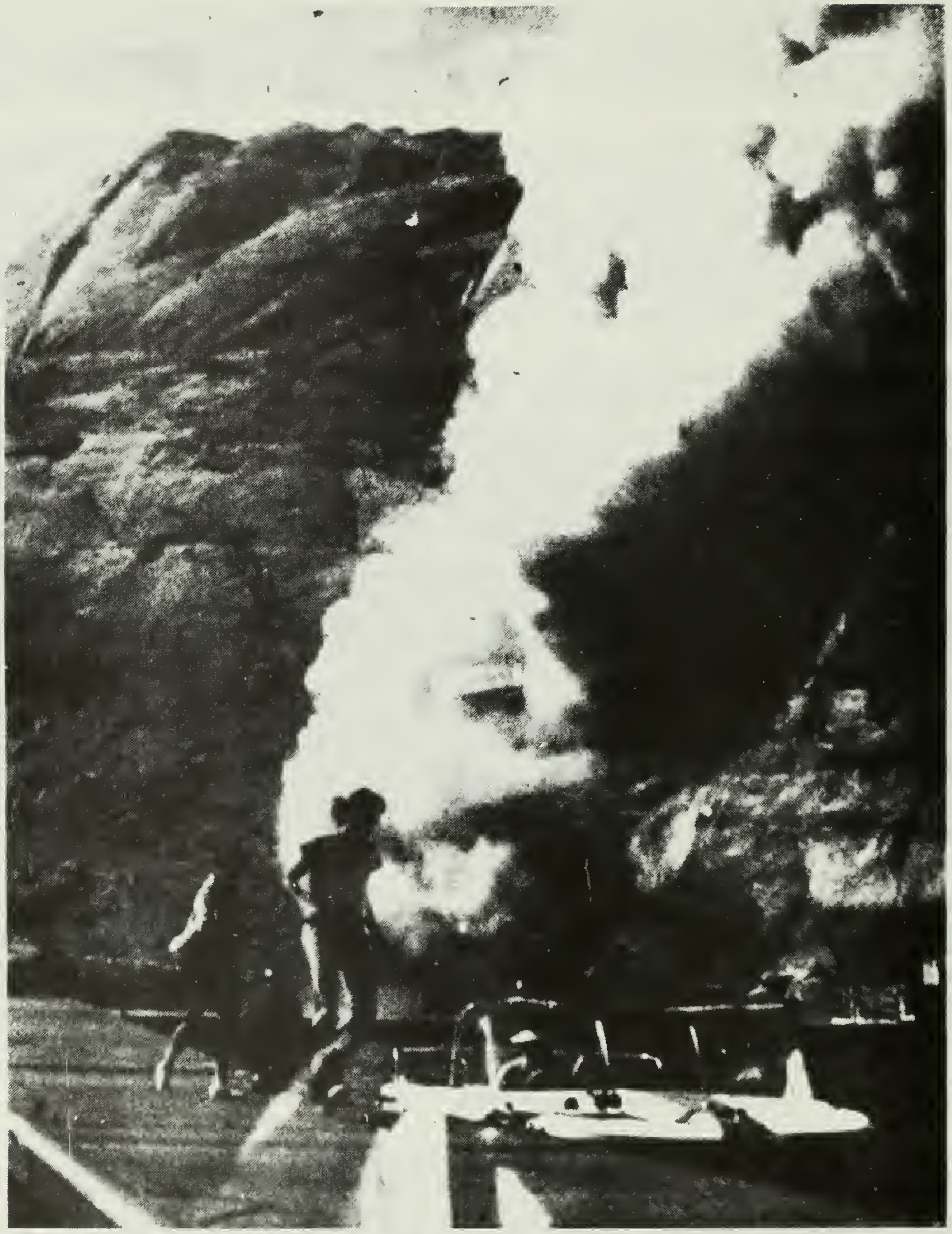
Geologic Stability. Rainbow Bridge was monitored for stability by the U.S. Bureau of Reclamation from 1974 through 1984 as part of the court settlement of a lawsuit contesting Bureau actions in allowing the reservoir waters of Lake Powell to enter the monument. The purpose of the monitoring was to detect any adverse effects on the stone arch caused by rising lake waters in the canyon beneath the arch's foundation. Measurement was to detect any movement or shifting of the bridge structure.

The BOR report in 1985, which summarized the results of the ten-year study indicated that no movement had been detected. Since the study, more modern equipment and techniques are now available and BOR continues the monitoring program, using improved techniques.

Rockfall Hazard. Erosion is a natural process throughout the monument but is accelerated by wave action, lake level fluctuations, and multiple trailing. Rockfall due to natural processes poses a threat to the safety of visitors. The photo on page 64 shows a rockfall at the monument dock area. Currently BOR makes an annual inspection of the monument for possible rock hazard safety problems.

"Numerous rockfall hazards exist to visitors of Glen Canyon National Recreation Area and Rainbow Bridge National Monument....Rockfalls are not unusual events along the shoreline and in the canyons surrounding Lake Powell....The creation of Lake Powell and later development of recreational opportunities on the lake have transformed rockfalls, which occurred in desolate canyon regions into life-threatening hazards to recreationists, who now frequent these canyon areas." (*Rockfall Hazard Report for Rainbow Bridge National Monument (RHR)*, BOR, 1988) The most common rockfall in the area occurs for stress relief on massive sandstone rock walls.

Two rock units associated with rockfall can be identified within the monument; 1) Exposed Kayenta formation sandstone in the inner channel of Bridge Creek Canyon that forms the foundation of Rainbow Bridge; 2) The Navajo sandstone formation exposed within the monument. Rockfall associated with the first area is considered low. Because of the Navajo formation's tendency to develop stress relief joints, massiveness and exposed high vertical cliffs, the associated rockfall potential of the second area "is considered high to extreme in the monument." (*RHR*, Pg 3)



Rockfall at Rainbow Bridge Dock Area

"Several rockfalls have occurred along Lake Powell shorelines that have caused loss of life to boaters....It is not feasible to provide complete 'No Risk' protection from rockfalls to visitors of the monument...mechanical stabilization or removal could be utilized on individual isolated slabs in areas determined of critical nature with some success." *(RHR*, Pg 4) The most cost effective way is to "...utilize the strategic placement of visitor facilities with respect to the proximity of canyon walls and areas of recognized potential of rockfall hazard...to locate (when practical) trails and docks a safe distance from vertical walls." (*RHR*, Pg 4)

Specific recommendations made regarding rockfall by the BOR report include:

- Strategic placement of visitor facilities is the most realistic, cost effective and aesthetically pleasing approach to achieving a reduction of potential rockfall hazards to visitors of the monument. Field review of the proposed and modification to existing facilities should be conducted during the planning and design phases of projects to ensure that geologic hazard considerations are incorporated.

- Where potential rockfall hazards cannot be avoided, siting of facilities should be accomplished to minimize the duration of time visitors are exposed to a particular hazard.

- Due to the ever-changing nature of the canyon walls, periodic field inspections should be made of existing visitor facilities to ensure that changes in geologic conditions do not unnecessarily place the monument visitor at risk.

- The BOR would continue to perform established landslide and rockfall surveillance programs annually within the Rainbow Bridge National Monument and along Lake Powell's shoreline. In addition, the BOR would, upon request, continue to provide geologic and geotechnical assistance to the National Park Service.

Soils. Fine sandy soils from the Entrada and Navajo geologic formations are most prevalent throughout the area with caliche and bentonite deposits occasionally found near the surface. Many visitors using the area immediately around Rainbow Bridge have created a network of paths or multiple trails. This has resulted in erosion, soil compaction, loss of vegetative cover, and mass wasting in sandy areas.

In areas near the bridge and shoreline where the trail is less defined, as much as a foot of the limited topsoil has been lost. Some places are worn down to the Kayenta formation bedrock with no soil left.

Impacts of the No-Action Alternative

Geologic Stability. The purpose of continued monitoring is to obtain a continuous record of the exact position of the arch and detect any shifting or movement caused by the reservoir or outside influences. Monitoring will also provide baseline data on the arch to permit evaluation of natural weathering and other processes affecting the span. The BOR's monitoring program would continue and the National Park Service would continue to cooperate with the BOR and its programs. There would be no effect as a result of this alternative.

Rockfall Hazard. None of the recommendations of the BOR report would be implemented and the threat to the safety of the visitors would not be reduced.

Soils. Because there are no defined edges for the existing trail system, the likelihood of keeping visitors on trails is low. Visitors would probably continue to trample and compact large areas adjacent to the existing trail system. Soil erosion would continue.

Impact of Alternative A, Alternative B, and the Proposal

Geologic Stability. The purpose of continued monitoring is to obtain a continuous record of the exact position of the arch and detect any shifting or movement caused by the reservoir or outside influences. Monitoring will also provide baseline data on the arch to permit evaluation of natural weathering and other processes affecting the span. The BOR's monitoring program would continue and the National Park Service would continue to cooperate with the BOR and its programs. There would be no effect as a result of these alternatives.

Rockfall Hazard. While the National Park Service recognizes that it cannot eliminate natural hazards that pose potential risks to the safety of visitors at the monument, it can seek prudent and reasonable measures to reduce those risks. Risk reduction would be implemented under all alternatives and would include all recommendations made by the BOR in addition to authorizing the periodic removal of identified rockfall hazards within the monument. Thus, the effect would be a large reduction in the risk to the safety of visitors of the monument.

Soils. Trails and other impermeable structures would either wholly or partially eliminate direct inflow of water to soil. Compaction of soils in these areas would occur either deliberately (as is the case for roads) or as a result of settling, due to the weight of material used on trails. Site preparation (leveling) on trails and congregating areas, although minor, would result in either removal or addition of earth, destroying the soil structure. Topsoil would be removed from areas to be covered by paving and would be used to supplement any shortage of topsoil incurred by other facilities. All trails and congregating areas would be constructed where the slopes are less than 15 percent, to minimize the soil erosion created by foot traffic. Paved trails would be provided where heavy foot traffic is anticipated, and visitors would be encouraged to stay on maintained trails. A low-impact hardened trail system for visitors and to protect soil and vegetation resources is proposed for Rainbow Bridge.

Impervious surfaces would collect and divert precipitation to adjacent areas and would be constructed in a manner that minimizes disturbed areas. The runoff not collected and diverted to natural drainages would pour out on adjacent areas, increasing the local soil moisture regime. The increased runoff in these areas could result in localized increases in erosion of sandstone. Altered vegetative composition would also create slight changes in soil chemistry. Topsoil from disturbed areas would be set aside and replaced following construction, minimizing the loss of organic material in the soil. These areas would be reseeded with native species to speed the rate of recovery and to minimize the encroachment of invading species. To the maximum extent possible, water runoff from impervious surfaces would be directed to natural drainages, minimizing the impacts of increased available moisture.

Soils in and around trails and congregating areas and interpretive facilities would be affected by foot traffic. The primary impact on soils would be compaction, which would decrease permeability, locally alter the soil moisture and diminish the water storage capability. Direct impacts on soil would result in slower rates of water transmission within soils and increased runoff on the surface, increasing soil erosion. Prolonged trampling would gradually decrease vegetation and increase exposure of bare ground to the direct erosive impact of rainfall. Erosion would take the form of channelization on barren areas of even slight slope. Low-impact hardened trails would help to keep heavy visitor use confined and mitigate some of these effects.

Vegetation

Description. The monument is located within the Colorado Plateau primarily supporting desert-shrub vegetation. The plant communities are riparian (near the water), grassland, blackbrush, talus slope (sparsely vegetated shrubland growing on talus slopes), and hanging gardens (specialized wetland vegetation growing along seeplines). There is a wide diversity of plants in these communities due to the numerous micro-climates in the monument.

Within the canyon area, the effect of aspect and water is evident by the microclimates they create for plants. Vegetation within the monument area, which reflects the scarcity of rainfall, lies on the southeastern facing slopes and flat exposed areas of the inner Bridge Canyon. These include areas sparsely covered with saltbush (*Atriplex confertifolia*), blackbrush (*Coleogyne ramosissima*), bottlestopper (*Eriogonum inflatum*), prickly pear (*Opuntia erinacea*), and various grasses.

On northerly facing slopes and canyons, Utah juniper (*Juniperus osteosperma*), narrow leaf yucca (*Yucca angustissima*), rabbit brush (*Chrysothamnus nauseousus*), joint fir (*Ephedra spp.*), and a few squawbush (*Rhus trilobata*) can be found.

In narrow canyons protected from exposure that create microclimates of their own, Gamble's Oak (*Quercus gambelli*) and redbud are evident. Buffalo berry (*Shepherdia rotundiflora*), rabbit brush (*Chrysothamnus nauseosus*), Indian ricegrass (*Oryzopsis hymenoides*) are prevalent as dense undergrowth against canyon walls.

Where seeps in the sandstone exist, maidenhair ferns (*Adiantum capillus Veneris*), monkey-flowers (*Mimulus eastwoodiae*), and various mosses thrive. Moist drainage bottoms support cottonwoods (*Populus fremontii*) and reeds (*Phragmites communis*). Tamarisk (*Tamarix ramosissima*), an exotic species, is prolifically reproducing itself on the shoreline areas of Bridge Canyon. The photo on page 69 shows tamarisk near Rainbow Bridge.

Two definitive changes took place within the monument that were a direct result of the storage project - significantly increased visitor use and a change in the plant ecology of the area. Previously, the monument was accessed by land trails and was relatively isolated. With the lake inundation came increased access. Visitor use climbed to over 210,000 in 1987 and Rainbow Bridge became a major destination point for tourists. The water storage changed the ground water characteristics of the area, resulting in a later change in plant ecology. Exotic species like tamarisk (*Tamarix ramosissima*), whose small seed is widely distributed by the wind, are now prolific along the shoreline of the monument.

Impact of the No-Action Alternative. Plants that invade disturbed areas would become more common. Increased erosion would lead to exposure of root systems and the later death of more mesic plants. Germination of some plant species may be inhibited by soil compaction resulting from foot traffic. The impacts of trampling would range from complete exclusion of vegetation to slight shifts in species composition. Tamarisk would eventually obstruct the view of Rainbow Bridge.

Impact of Alternative A, Alternative B, and the Proposal. All alternatives restrict visitors to the existing trail system. The question becomes how successful each alternative is in accomplishing this goal. The proposal and alternative B call for a low-impact, hardened trail system, which would clearly mark edges of the trail and would probably yield the highest chance of success in keeping visitors on trails. Alternative A calls for a gravel surface.

Effects on vegetation would be minimal because visitors would be confined to trails. However, some small secondary effects could occur in areas adjacent to trails.

Precipitation that falls on impervious surfaces would not be absorbed. Where this runoff is not efficiently collected and diverted to natural drainage systems, it would pour into adjacent vegetated areas, which could alter the natural composition of vegetation.

Manual methods of scarification would be used for rehabilitation before seeding areas denuded of vegetation. This would minimize the overall loss of topsoil caused by development and encourage revegetation. During the recovery period for areas of existing trampled vegetation, the artificially seeded or replanted native vegetation would not be identical in composition to vegetation in adjacent areas.

Floodplains and Wetlands

Description. Appendix D, Flash Food Mitigation Plan, describes the specific actions recommended by this plan. The main area of concern for the monument revolves around flash floods. The NPS final procedure for implementing E.O. 11988 and 11990 (45 Federal Register 35916 as revised by 47 Federal Register 36718) defines a "flash flood" as a flood in which the waters rise so rapidly there is insufficient time for warning and evacuation of persons threatened by the flood. When elevation levels for Lake Powell drop below the full operating pool of 3,700 feet, some of the monument is in a flash flood, high hazard area. The 100- and 500-year flood elevations from Bridge Creek above the lake are

Tamarisk Near Rainbow Bridge

estimated to be 7.5 and 10 feet above the bottom of the channel, respectively (memo and personal conversation, Smillie, 9/89). That area can be defined as the area of Bridge Canyon Creek immediately before entry to Lake Powell. The high hazard area is undeveloped and there are no structures or trails within the area, from which humans would seek shelter. Flash floods are most likely to occur during times of the highest visitor use, the summer thunderstorm season (memo, Smillie, 6/89).

Steps outlined in the Floodplain Mitigation Plan are based on information received from the Water Resource Division of the National Park Service (Smillie, memos, 6/3/89 and 9/89) that indicated a potential problem created by water from flash flood waters entering Lake Powell near Rainbow Bridge. This divided hazards from flood flows in Bridge Creek into three general areas: 1) above the lake; 2) a short reach near the terminus of the lake (transition area); 3) the lake beyond the transition area. The delineation of these areas will vary based on the elevation level at Lake Powell. At full operating level of 3,700 feet, the dock facilities would be located more than 2,000 feet from the end of the water channel. At lake elevation 3,650, some floating dock facilities could be located as close as 400 feet to the end of the water channel. For a full discussion on fluctuating lake levels see Water Resources.

For the area above the lake, analysis indicated that the trail that follows the creek was located on a bench well above the channel and is out of the 100- and 500-year floodplains near Rainbow Bridge.

For the transition area near the terminus of the waters for Lake Powell, analysis indicated that the actual location at any time would vary according to fluctuating lake levels and flood magnitude. At normal levels, the transition area would include Rainbow Bridge itself and the existing floating walkway (memo, Smillie, 6/89). The transition area would be subject to some water surface elevation increase, surface turbulence, and significant velocities. The walkway and any other facilities within the transition area would become unstable and could be torn from its moorings, making evacuation from the site dangerous. The transition area is not within the high-hazard flash flood area, but is subject to the effects of a flash flood. These factors need to be taken into account during the design of the facility's anchoring system.

For the lake beyond the transition area, analysis indicates little or no discernable water surface increase would occur and surface turbulence would be limited. The lake beyond the transition area is not within the high hazard flash flood area and is not subject to the effects of a flash flood although some surface waves may be present below the transition zone.

Although no wetlands are affected by any alternative, there are some areas that support perennial riparian species, such as the *Phaegmites* and the hanging gardens described previously.

Impact of All Alternatives and the Proposal. None of the alternatives would affect the water resource values of the floodplain related to the natural moderation of floodwaters, maintenance of water quality, and groundwater recharge. There are no critical actions (fuel storage facilities, sewage treatment plants larger than 40,000 gallons-per-day [gpd], emergency clinics or hospitals, or areas that contain irreplaceable documents or objects) associated with any alternative.

There are no known secondary effects on floodplains or wetlands. A small amount of excavation material may be discharged when docks are anchored to land.

No developed areas are within the 100-year or 500-year floodplains. The existing land trail is outside of the 100- and 500-year floodplains. Dock facilities at the monument, however, are susceptible to wave surges caused by flash floods.

Flash Floods. When Lake Powell is at full operating pool (elevation 3,700 feet), flash flood areas are in the Bridge Canyon drainage, just outside the monument. When Lake Powell lake levels drop to 3,660 feet, the decreasing reservoir pool exposes land within the monument, flash flood areas increase, and flash flood

> areas move into the monument. All facilities are outside of the 100-year and 500-year flash flood areas, however, facilities on the water at Rainbow Bridge National Monument could be affected by wave surges created by flash floods. For that reason, a flash flood mitigation plan (Appendix D) was developed within NPS guidelines for compliance with Executive Order 11988 (Floodplain Management). Executive Order 11988 was developed "in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practical alternative," (E.O. 11988; 42 FR 26951). Consistent with these guidelines the National Park Service has developed the following objectives (listed in priority order) for floodplain management at Rainbow Bridge: protect life, allow existing visitor use areas to remain open to the public wherever possible, and protect property.

Three types of floods are considered in the Appendix D--100-year, 500-year, and probable maximum flood (PMF). The 100-year flood is a flood that can be expected to be equaled or exceeded on average once every one hundred years. Floods of this magnitude occur frequently enough to pose a serious threat to all facilities and people. The area affected by a 100-year flash flood consists of facilities located in the transition area described above. In this area, estimates for the 100-year flood and 500-year flood are about 7.5 feet and 10 feet above the existing channel bottom, respectively (memo, Smillie, 9/89). Existing trails are located outside the area of 100- and 500-year floods.

The PMF is the largest flood that can ever be expected to occur in an area; however, these floods are rare, and their statistical probability of occurring is uncertain. No PMF is recorded for the area. Worst case estimates for the PMF and assumptions made by this plan are that all facilities are within the PMF. Actual delineation of the PMF will be done at the time of plan implementation. PMF limits will be used to set signing and provide visual information for a wayside exhibit.

The maximum number of persons who could be exposed to the effects of flooding is related to the carrying capacity of the monument -- 390 for the proposal and alternative A, 480 for alternative B, and unlimited for the no-action alternative.

There are four components of the Flash Flood Mitigation Plan -- a wayside exhibit, additional signing, evacuation and emergency preparedness procedures and a warning system. An eye-catching wayside can be added where every visitor would walk by it. Additional signs would be added telling visitors in the flood hazard zones where to move in case of a flood. Evacuation and emergency preparedness measures would be identified for the monument. A warning system would be installed and would provide enough warning time for the area to be evacuated and loss of life prevented. Acceptable warning times would be determined at the time of system design by the National Park Service Fort Collins Water Resource Unit and safety officials.

Water Resources

Description. There are several specific water resource-related areas directly affecting this project: the fluctuating water levels of Lake Powell, affecting access, and potential pollution affecting water quality.

Fluctuating Water Levels of Lake Powell. The Colorado River Storage Project Act, which established Glen Canyon Dam and created Lake Powell, had significant effect on the Rainbow Bridge. The finger of Lake Powell that is located inside the monument area can fluctuate radically. Normal lake operating ranges are from between 3,490 and 3,700 feet in elevation. The minimum elevation for operation of power generating units at the Glen Canyon Dam is 3,490 feet. The maximum elevation is 3,711, and the minimum 3,370 feet above sea level (dead storage). The highest historical reading is 3,708.34 feet (July 1983). Lake levels are normally the highest in midsummer from spring runoff, and the lowest in March or April. Full operating pool is 3,700 feet, while normal low operating pool is 3,680 feet.

Fluctuating reservoir levels have a direct effect on this project from a land access and facility design standpoint. According to a Reservoir Level Probability Study done for Lake Powell in 1986, a typical year would draw the reservoir down to elevation 3,683 feet, a 17 foot vertical elevation drop from the normal operating level of 3,700 feet. It also established the maximum and minimum elevations, with a probability of exceedence. These are summarized in the figures on page 73.

According to the study, there is a 90 percent probability of the minimum lake level minimum elevation being above 3,650 in year 2000 and there is a 90 percent probability of the maximum lake level elevation being below 3,700 feet. Normal high elevation is 3,700 feet. Facilities should be designed to accommodate land access, when water levels are as high as 3,700 feet and as low as 3,650 feet.

Landform beneath the water is steep. Previous to the establishment of Lake Powell, Rainbow Bridge had been accessed by a land trail through Forbidding and Bridge Canyons. The trail is shown in the photograph on page 76. Design of land-based trail facilities needs to accommodate land access from the monument dock during periods of low water levels.

The entry point to the channel from land can be anywhere between these two elevations. With a vertical drop of 50 feet (3,700-3,650), any land access from the dock area will require a landform that will accommodate side hill ramping on a 12 percent grade. At the minimum elevation of 3,650 feet, this requires 416 feet of linear ramp to negotiate the grade. Facility design will need to consider these relationships. A water level below 3,650 feet would require the use of the old land trail and would limit access to persons with disabilities.

Water Quality and Pollution. The water quality of the monument and Bridge Creek is monitored regularly and is considered good. No occasions of contamination have been found. The water on Lake Powell is usually of high clarity and quality and would be expected to meet standards for full-body contact sports, such as swimming and water skiing. Water near the dock area, however, is often times contaminated with fuel spills from outboard motors. Surface films from boat

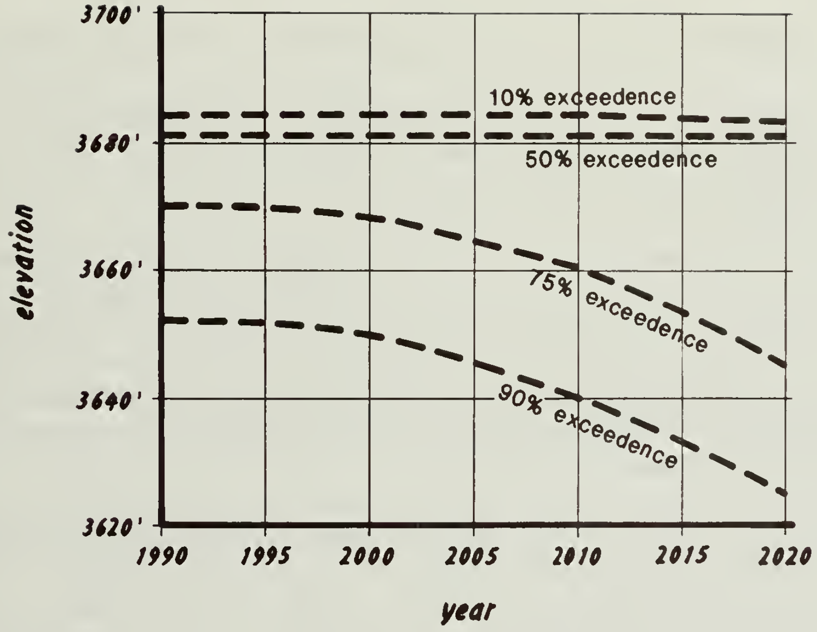


Figure 2
Lake Powell Minimum Annual Elevation

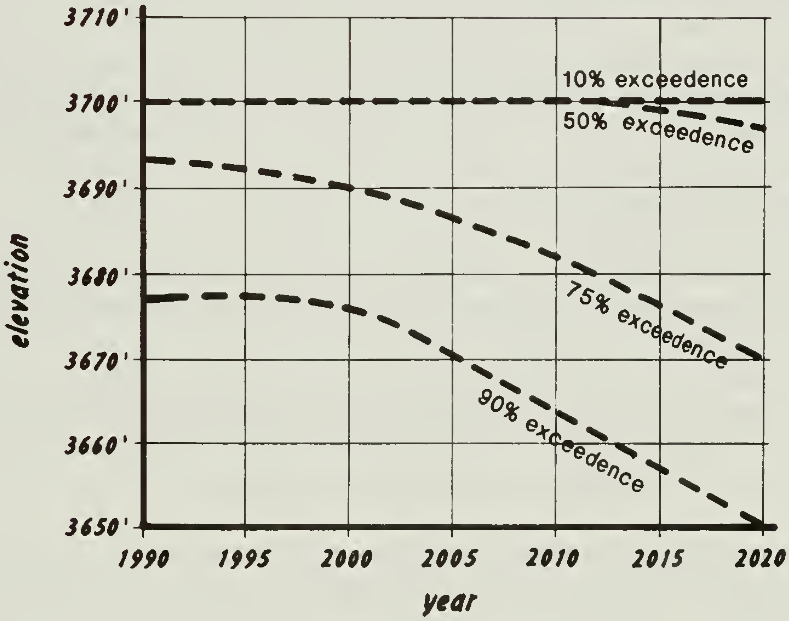


Figure 3
Lake Powell Maximum Annual Elevation

fuel are sometimes present on Lake Powell around the docks at Rainbow Bridge.

There are a few hanging gardens and one spring located in seeps associated with the Navajo sandstone of the monument. Water quality from Navajo sandstone is typically of good quality.

Impact of the No-Action Alternative. Based on estimates described above for fluctuating water levels, there is a 10 percent chance of future lake levels eliminating land access for persons with disabilities, where lake levels drop below 3,650 feet. No viewing of the Rainbow Bridge would be provided for persons with disabilities if the lake elevation dropped below 3,650 feet. In addition, Figures 2 and 3 indicate a projected decline in Lake Powell Water levels beyond year 2000, but based on topographic data, there is no indication that docks within the monument boundary would ever sit on dry land.

In low-water years (lake elevation between 3,490 and 3,650 feet), access to the monument would have to be via the now submerged old land trail through Bridge Canyon. The courtesy docks would be moved along this trail to a location where adequate water access is feasible. Should this occur, some erosion may result, producing a small amount of sediment.

There are no water developments within the monument.

Impact of the No-Action Alternative and Alternative A. Water pollution from boat motors would continue.

Impact of Alternative A, Alternative B, and the Proposal. Based on estimates described above for fluctuating water levels, there is a 10 percent chance of future lake levels eliminating land access for persons with disabilities, where lake levels drop below 3,650 feet. In addition, Figures 2 and 3 indicate a projected decline in Lake Powell water levels beyond year 2000.

In low-water years (lake elevation between 3,490 and 3,650 feet), primary access to the monument would be the now submerged, old land trail within Bridge Canyon.

Construction activities may cause a temporary increase in erosion, increasing turbidity. The amount would be minimal in comparison with the yearly effects of spring runoff.

There are no water developments proposed.

Impact of the Proposal. Water pollution can be caused by boat motors. The most significant source of pollution by motors is caused by leakage of oil and gas through the crankcase. A small fraction of nonvolatile hydrocarbon is not removed by evaporation from water exposed to submerged, two-cycle engine exhaust emissions. Since the proposal is designed to limit the number of boats at the monument, water pollution at the monument would be largely reduced. Water pollution may be reduced at the transfer dock because of control over boating in the channel through the contact station and future shuttle transportation system. The transportation system would enable management to disperse peak loads, thereby reducing boats at any one time in the channel.

Impact of Alternative B. Since this alternative moves boats just outside the monument boundary, water pollution from boat motors would be reduced in the monument but a small increase could occur at the dock area because of the increase in dock capacity for boats.

Air Quality

Description. Rainbow Bridge is established as a Class II Federal air quality area. The air quality of the area was monitored before the start-up of the Navajo Generating Station in Page, Arizona. Page was identified as a rural industrial area for Total Suspended Particulates (TSP) because it previously had violations and it contained major industrial development (Navajo Generating Station).

Air quality studies began in 1972 for the Lake Powell region. This data was used as background data for future monitoring and indicated that local air quality was excellent (Walter *et al.*, 1977). TSP monitoring indicated violations of the National Ambient Air Quality Standards for particulates in 1976 and 1977, which were apparently due to construction activity in Page. Page is classified as an attainment area for all regulated air pollutants, including particulates.

The average visibility described in 1974 as "excellent" (about 125 miles) is now noticeably less. The NPS in cooperation with other State and Federal Agencies and private industry has developed an extensive monitoring plan for gaseous and particulate constituents of the atmosphere. Research objectives include an in-depth analysis of the regional airshed and the identification of emission sources.

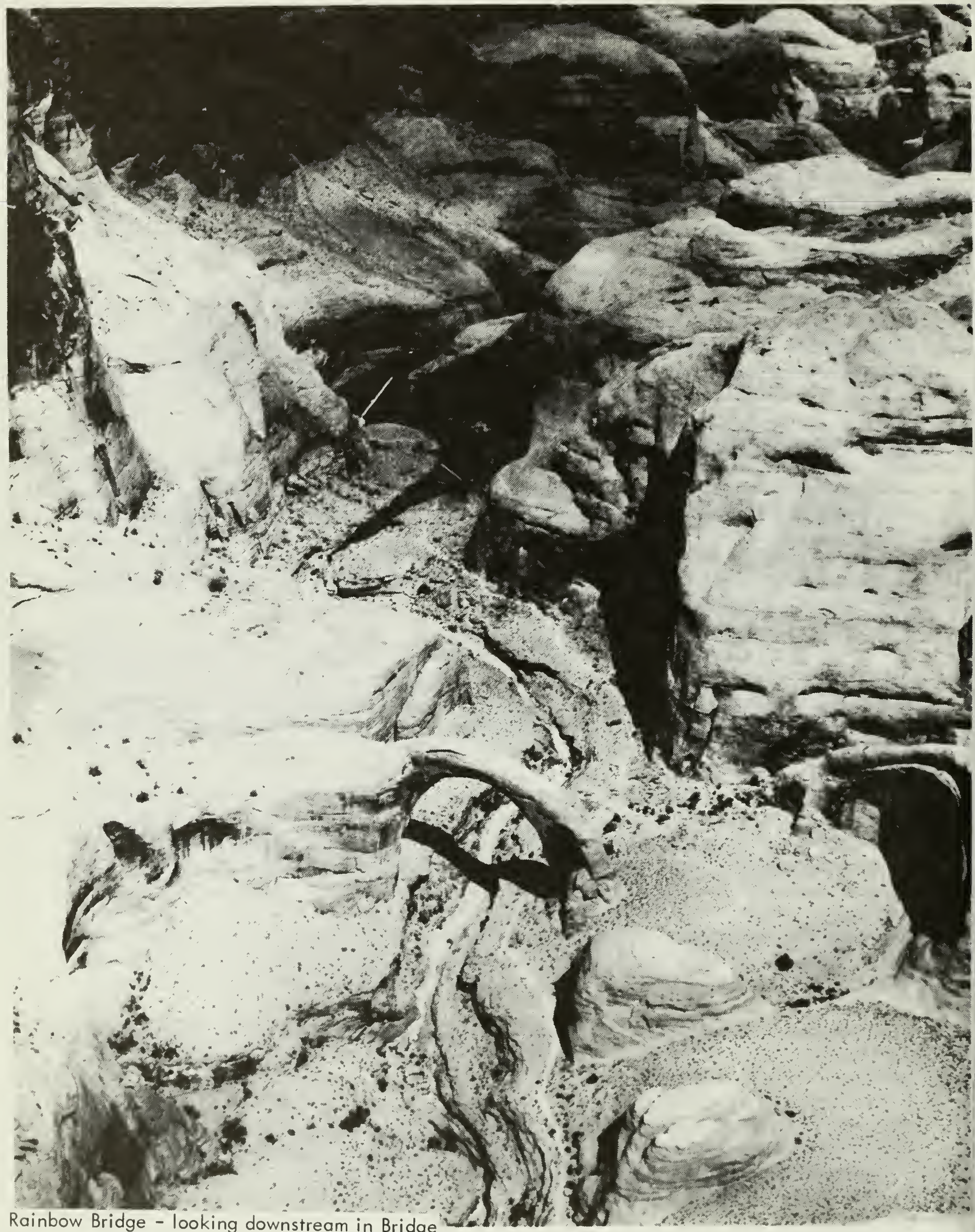
Impacts of the No-Action Alternative. Vegetation along existing dirt trails is subject to the adverse effects of dust generated by heavy visitor foot traffic. Vegetation adjacent to the existing land access trail could be covered with dust and eventually die. In some areas this, as well as off-trail visitor traffic and trampling, has resulted in large areas being stripped of vegetation. Dust problems would remain under the no-action alternative.

Impacts of Alternative A, Alternative B, and the Proposal. The improvement of the existing land trail to a low-impact trail, would reduce dust levels through surface improvements and by helping to confine visitors to a defined trail system.

Construction activities temporarily increase the amount of particulates in the area.

Noise

Description. Noise levels can affect natural resources as well as archeological sites. They can also interfere with visitor experience. Records show that an increasing number of people under the bridge increases the sound level in the area.



Rainbow Bridge - looking downstream in Bridge Canyon. Lake Powell at 3621.47' - 7/21/71.

Land Trail to Rainbow Bridge at Low Lake Levels

Information obtained in 1986 and 1989 on noise is relevant to problems identified at Rainbow Bridge. According to a National Park Service Noise Level Monitoring program done in 1986, visitor activity results in the greatest auditory threat to the monument. Noise levels from aircraft, boats and visitors, as well as the types of aircraft and boats with their direction of travel, approximate altitude of aircraft, and time of observation were recorded. Noise level readings from aircraft varied from 51 to 70 decibels, averaging 61.3. Tour boat horns and tour/houseboat motors registered the loudest noise of 78 and 74-72 decibels, respectively. Noise levels were associated with activities not considered appropriate in the monument area. Of particular relevance to the proposal, is the fact that when 80 or more people were under Rainbow Bridge, decibel levels reached 79. This can be compared to a decibel level of less than 35, when less than 20 visitors were under Rainbow Bridge.

Noise level monitoring done in 1989 by the NPS indicated that background noise at Rainbow Bridge was relatively low, generally ranging from 20-35 decibels. The data clearly shows that the increased noise levels occur in patterns that are discernable when boats are on Lake Powell.

Impact of the No-Action Alternative. Visitor conflicts would continue to occur. Noise from tour boats and visitor distribution of 80 persons or more under Rainbow Bridge would continue.

Impact of the Proposal. Under the proposal, both tour boat and visitor noise would be largely reduced. By limiting tour boat use to 195 PAOT (50 percent of total capacity), controlling boat entry, and establishing a shuttle system, boat noise would be reduced. Under this alternative, management of the number of visitors under Rainbow Bridge would be possible. This would largely reduce visitor noise and visitor/vistor conflicts.

Boat noise at the transfer dock would not be regulated. However, being far removed, it would not interfere with the monument. Higher noise levels at the transfer dock can be considered acceptable, because boat noise is expected.

Impact of Alternative A. Noise from tour boats and some visitor noise would be slightly reduced. A wakeless zone would be an attempt to regulate noise from larger boats. Because this alternative allows more individual freedom for visitors at the monument, regulation of the distribution of visitors under Rainbow Bridge and the reduction of visitor to vistor conflicts is not likely.

Impact of Alternative B. Under this alternative, boats are removed from the monument by extending the monument dock outside the monument boundary, physically separating boats from the monument. Not only would the landform visually separate the dock from the monument, but it would also muffle sound to the monument. Therefore, boat noise would be largely reduced within the monument.

While the actual number of boats at Rainbow Bridge would increase, boat noise just outside the monument where visitors unload would be reduced because of the wakeless zone.

Interpretive services and some management of visitors would help limit the number of visitors under Rainbow Bridge. This should result in a reduction in visitor noise.

Wildlife

Description. Animal life is typical of a semidesert climate. Mule deer, coyote, and gray fox range widely throughout the area and use the monument. Jackrabbit, birds, rodents, and reptiles inhabit the monument. Fish species are extensive throughout Lake Powell and in Bridge Canyon. The fish species in the monument include striped bass, crappie, largemouth bass, carp, and bluegill. Fishing is not allowed in the monument.

Impact of the No-Action Alternative. There would continue to be some human disturbance to wildlife due to unrestricted access of the monument by visitors. Existing conditions at the monument would remain unchanged.

Impact of Alternative A, Alternative B, the Proposal. By restricting visitors to trails, there would be a reduction in disturbance to wildlife.

Threatened and Endanger Species

Description. According to the U.S. Fish and Wildlife Service (9/15/89), the endangered bald eagle (*Haliaeetus leucocephalus*), endangered peregrine falcon (*Falco peregrinus anatum*), the endangered humpback chub (*Gila cypha*), the endangered bonytail chub (*Gila elergans*), and the endangered Colorado squawfish (*Ptychocheilus lucius*) are found in Glen Canyon National Recreation Area.

According to the U.S. Fish and Wildlife Service (9/15/89), current candidate species that could occur within the planning area are the ferruginous hawk (*Buteo regalis*), the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and the razorback sucker (*Xyrauchen texanus*). According to park biologists, none of these have been recorded in the planning area. In addition, although there are no endangered, threatened, or rare plant species in the monument, *Primula specuicula*, (primrose family) exists in the monument. It is considered as a 3(C) category by the U.S. Fish and Wildlife Service. (3[C] is a category used for plants that have been determined to be too widespread, or lack sufficient threats to warrant further consideration under the Endangered Species Act.)

According to park biologists, two endangered species, the peregrine falcon and the bald eagle use the monument. In 1989, a pair of peregrine falcons established an aerie near the arch during their nesting season and bald eagles use the monument area in the winter. The Navajo Mountain vole is known to occur nearby at an elevation of 10,000 feet elevation. Currently, it is not known to inhabit the monument. Monitoring is carried out on a continuing basis by park staff for endangered, threatened, and rare species.

Park biologists indicate that no humpback chubs, bonytail chubs, or Colorado squawfish are known to exist within the monument. The chubs need fast currents and deep waters, while the squawfish need variable flows, high silt loads and turbulence. Neither is present at Rainbow Bridge, so the likelihood of finding these species in the future is small. Presence of the razorback sucker has never been recorded at Rainbow Bridge. Both the yellow-billed cuckoo and the ferruginous hawk are transient and could inhabit the monument from time to time. The cuckoo's habitat includes wood and bushes especially during tent caterpillar outbreaks. The hawk feeds entirely on rodents. Neither have been sighted at the monument, but biologists indicate there is a need to monitor for all endangered and candidate species. This action is recommended for all alternatives as part of the RMP (Appendix C).

Impact of All Alternatives and the Proposal. Low-impact trails with high visitation and other evidence of human presence have existed since the creation of Lake Powell gave access to Rainbow Bridge. Nesting activity for peregrine falcons is being monitored. Future conflicts could arise with eagles or peregrine falcons. If use did interfere with either species, areas in conflict with visitors would be closed to avoid affecting endangered populations.

Based on current indications and actions outlined in all alternatives and the proposal, *the park has determined that these alternatives would have no effect on the endangered bald eagle, endangered peregrine falcon, the endangered humpback chub, the endangered bonytail chub, or the endangered Colorado squawfish.* The need for establishment of a monitoring program is part of the proposal and all alternatives. The National Park Service will seek concurrence with the U.S. Fish and Wildlife Service on their finding of no effect.

SOCIOECONOMIC ENVIRONMENT

Regional Economy

Description. Tourism to Lake Powell and Rainbow Bridge contributes to the Page, Arizona, and Southern Utah economy. Tourism is a major element of the regional economy.

> **Page.** Page is located approximately 40 miles southwest of Rainbow Bridge. "Lake Powell, the Navajo Generating Station, and tourism are major economic factors in Page.... Tourism and the distance to other trade centers have created a demand for a wide variety of consumer goods and services. Therefore, 70 percent of the employers are in the retail trade and services sector, with over 50 percent of the total employed." (Community Profile, Page, Arizona, Department of Commerce.) The community relies heavily on tourism for the retail trade. Taxable sales grew twenty percent between 1986 and 1988.
>
> **Utah.** Visitors from out-of-State contributed more than $1.5 billion in 1986 with 25 percent of the expenditures on food and 25 percent on public transportation. Travel expenditures generated $425 million in wages and salary and more than 47,000 jobs. This accounted for $82 million in State tax revenue and nearly $28 million for local governments (The Utah Tourism Study, Executive Summary, 1987). Lake Powell, Rainbow Bridge, and the tourism generated by recreational facilities

is important to the economy of Utah.

Impact of the No-Action Alternative. Continued deterioration of the natural and cultural resource attractions provided by Rainbow Bridge could decrease visitation to the area. Within the context of the broader regional economy, the effect would be small.

Impact of Alternative A, Alternative B, and the Proposal. Providing a quality recreational experience of Rainbow Bridge National Monument, one that would be remembered, could help increase recognition of the heritage this area can provide and increase visitation. In turn, this would help contribute to growth in the tourism-dependent economies of southern Utah and Page, Arizona. In management's view, the proposal, provides for the most improvement in recreational opportunities at the monument, while Alternative A provides for the least. Within the context of the broader regional economy, the effect would be small.

Visual Resources

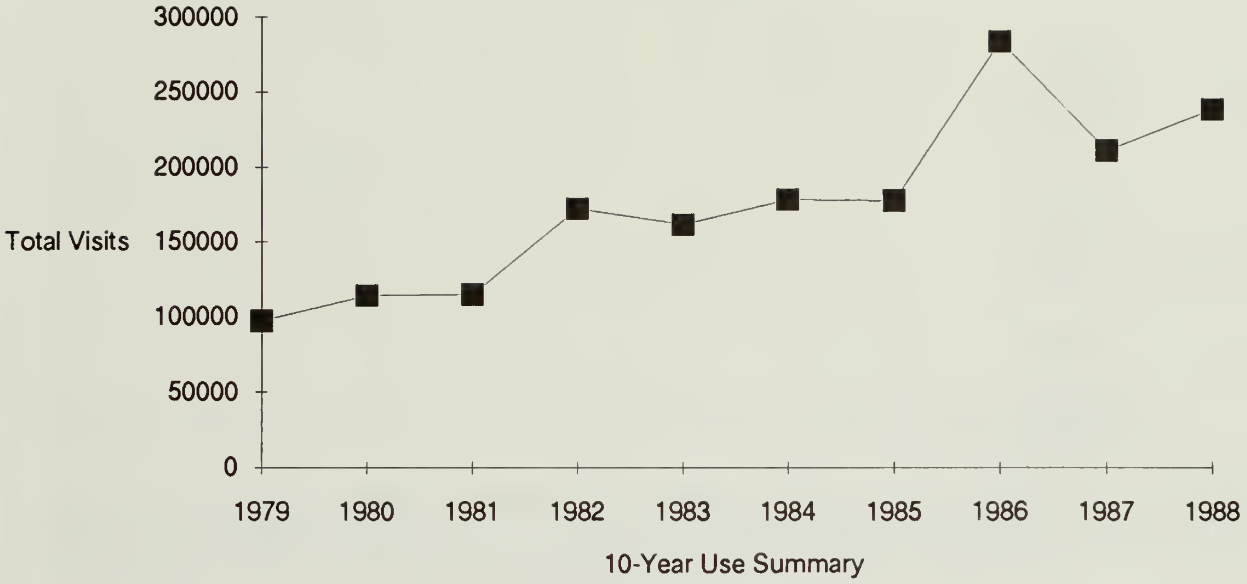
Description. The preservation of the natural scene is a primary natural resource objective. The presence and continued expansion of tamarisk, shown on page 69 threatens to impair this natural scene. The growth of tamarisk along the trail from the floating walkway to the bridge obscures photo opportunities, causing visitors to leave the path to get a clear photograph of the bridge. By leaving the path, visitors accelerate the soil compaction problem and damage the native vegetative cover.

Impact of the No-Action Alternative. If left unchecked, as would be the case in this alternative, tamarisk could eventually block the view of the bridge from current viewing point. In addition, continued trailing and erosion with undefined trails will continue to mar the natural scene.

Impact of Alternative A, Alternative B, and the Proposal. The use of low-impact trails, no development under Rainbow Bridge, and the selective or complete removal of tamarisk called for in these alternatives would help to insure the preservation of a natural scene.

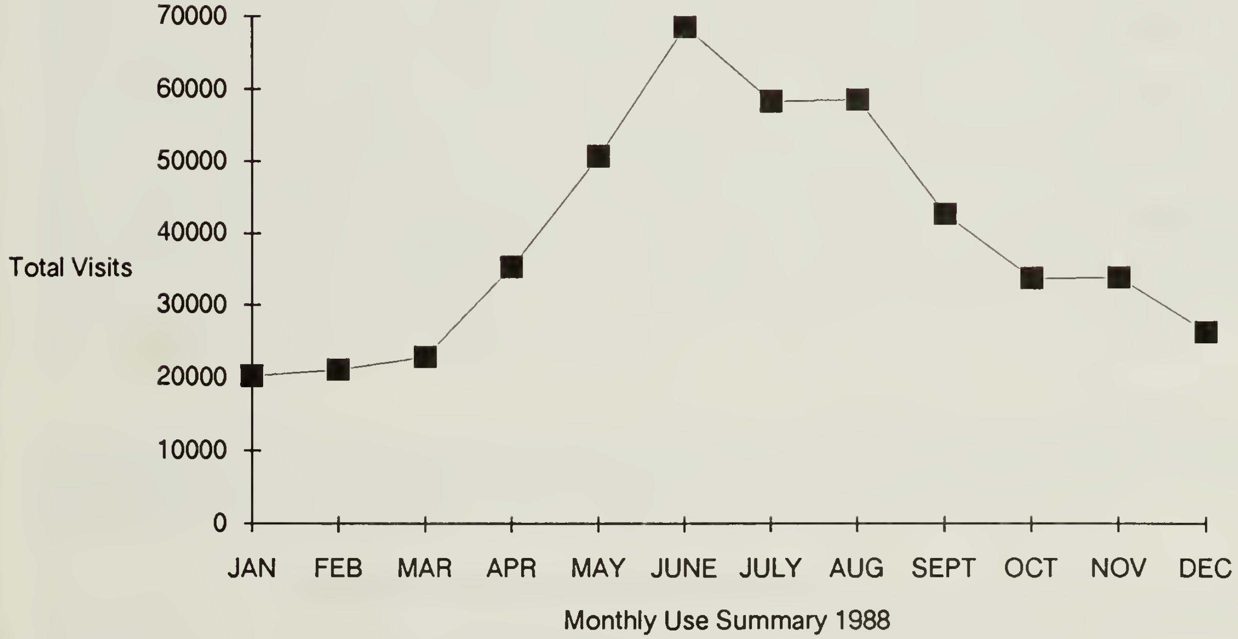
Visitor Use, Concession Tour Boats, and Economic Feasibility of Future Shuttle Transportation

Description. Visitor use at Rainbow Bridge has shown significant increase in recent years, peaking in 1986 at 285,000 visits, ending 1987 at 210,000 and 1988 at 238,000. Peak use season is April through October. Monthly peaks have reached as high as 65,000 visits (July 1986) or about an average of 270 persons at one time during an 8-hour operational period. Figure 4 (page 81) illustrates total yearly visitation for each year from 1979 to 1988. The park's seasonal visitation pattern has marked a dramatic increase from winter to summer, going through about a 200 percent increase from January to August. Figure 5 (page 81) illustrates total visitation for each month in 1988. Figure 6 (page 82) uses linear regression analysis to project visitation through the year 2000 based on past visitation from 1979. This indicates that if present trends continue, visitation would approach 450,000 by the year 2000. Figure 7 (page 82) shows the average distribution



10-Year Use Summary

Figure 4



Monthly Use Summary 1988

Figure 5

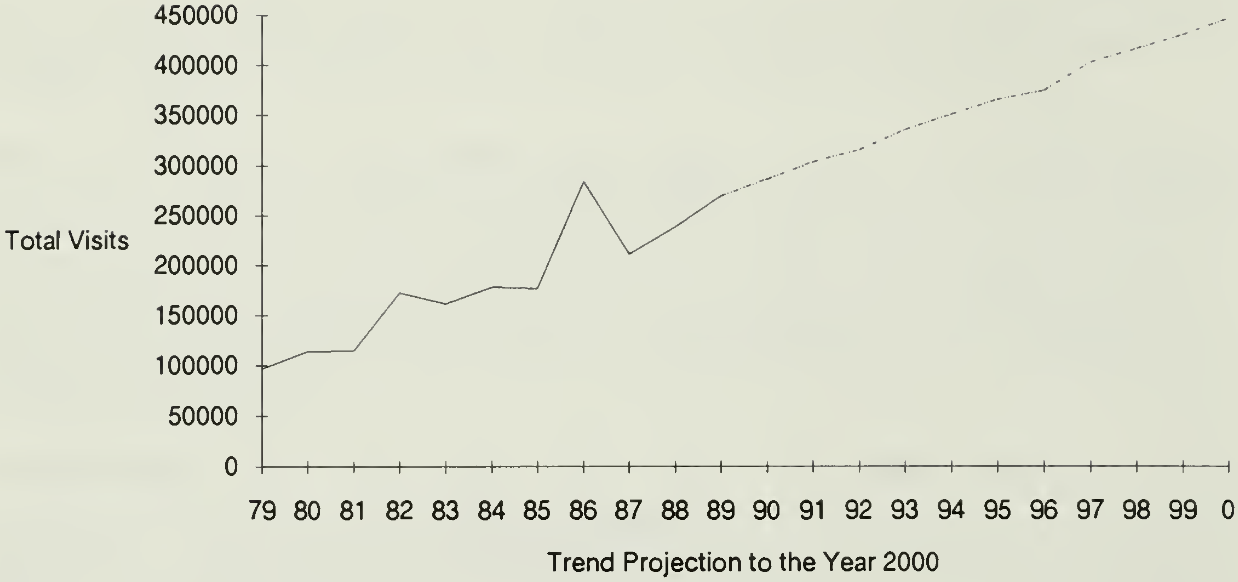


Figure 6

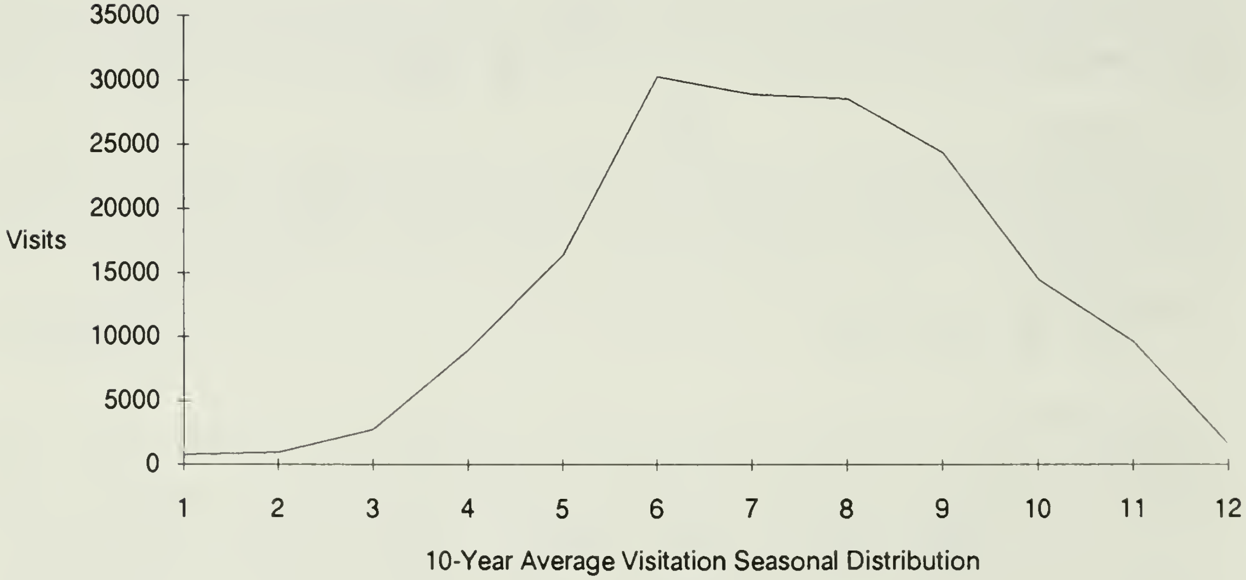


Figure 7

Table 2 - Tour Boat Passengers

Description	Wahweap 1987	Wahweap 1988	Bullfrog 1987	Bullfrog 1988	Total 1987	Total 1988	Units	% Change
Total tour boat passengers	105,503	108,192	2,224	2,666	107,727	110,858	Tours	3%
Tour boat passengers to Rainbow Bridge	51,165	59,382	1,866	1,292	53,031	60,674	Tours	14%
Peak tour boat passengers to Rainbow Bridge *	8,063	8,519	289	222	8,352	8,741	People	5%
(Peak month: 1987-Sept., 1988-Aug.)								

* Average: 6 tours per day and 46 passengers per tour

pattern for the last ten years. This figure is used to illustrate seasonal patterns.

Table 2, shows passenger breakdown for concession tour boat operations run by ARA Services to Rainbow Bridge for 1987 and 1988 seasons. Currently, there are no restrictions on the number of tour boats at the monument at any one time.

Projections are important in determining business estimates for recovering cost of investments in a shuttle system, whether the shuttle is operated by a concessioner or the Government. Two scenarios were examined with respect to recovering capital and operation and maintenance costs (O&M). These are shown in Tables 3 and 4 (pages 85 and 86). Under scenario 1 (Table 3), the U.S. Government would recover the costs of capital and O&M. Under scenario 2, the Government would recover only O&M costs. This would be done by charging for admission to Rainbow Bridge. Each shows the break-even point for various ticket prices. Visitation projections for the six and eight month seasons are based on distribution patterns shown in Figure 7 and are 85 percent and 96 percent, respectively. Tour boats under both are *not* assessed additional fees. Since surveys indicate that 23 percent of visitors to the monument come from tour boats, this is subtracted from visitation projection increases. Tables can be used to determine profit potential and an estimated subsidy, should one be considered, if visitation projections prove to be accurate. Visitation projections assume all current visitors would continue to visit Rainbow Bridge even if charged an admission, and assume an inelastic price relationship, up to a $9 ticket charge.

In scenario 1, if visitation increases as projected at an $8 ticket price, 10 percent interest on capital for 30 years and a six month shuttle season, year 1989 would be the first year that costs could be recovered. Under this scenario, an $8 ticket price appears to be what would be needed to recover total costs over time.

In scenario 2, if visitation increases as projected at a $6 ticket price and a six month shuttle season, O&M costs could be recovered in 1989. Under this scenario, a $6 ticket price appears to be what would be needed to recover O&M costs over time.

These tables should not be considered exact models, rather they should be looked at from the standpoint of showing the relative economic feasibility of a future shuttle venture.

They show both the potential for loss and profit under different scenarios, but are based on the premise of increasing use, using a linear regression equation of the last 10 years' use at the monument to project future growth. If use should decrease, losses would be incurred. In addition, interest rates of 10 and 7 percent were used. In scenario 1, interest payments account for about a third of the annual operating budget. If lower interest rates were used, profit would be expected to increase, if all other elements remained unchanged. Variables are numerous, but based on the assumptions used in each scenario, a shuttle is economically feasible. However, based upon experience there is a strong likelihood that there would be a decrease in visitation upon implementation of a fee shuttle system. Therefore, Phase II of the proposal has included the requirement of the completion of a market study to determine initial pricing and, if necessary, the amount of a partial subsidy prior that may be needed to support the pricing structure and visitation levels displayed for a fee shuttle system.

According to a sample survey done in 1988, 23 percent of visitors arrived by tour boat, 52 percent arrived by private boat and 25 percent arrived by rental boat. About 68 percent came from Wahweap marina, with 26 percent coming from Bullfrog marina and only 5 percent coming from Halls Crossing. Nineteen percent of the persons visiting Rainbow Bridge used the dock and walkway only, while 37 percent walked up to Rainbow Bridge itself and 36 percent walked the trail beyond Rainbow Bridge. The average number of people in a group was seven, while the average number of visitors in a group for tour boats was nine. The average number of visitors in a group for private and rental boats was seven. The average length of stay was 37 minutes, 31 minutes for persons from tour boats and 39 minutes for persons from private parties. Only 10 percent of the visitors visited other areas in Forbidding Canyon once entering the channel from Lake Powell, with 87 percent going directly to Rainbow Bridge.

Impact of the No-Action Alternative. Current resource damage from high levels of uncontrolled visitor use, such as trampled vegetation, soil erosion, and trailing, would continue. Visitor experience would probably decrease due to poor condition of facilities, overcrowding of some facilities, lack of adequate circulation and separation of uses, and lack of defined use areas. This could, in turn, result in a decrease or leveling off of visitation at the monument.

There would be no effect on current concession operations.

Impacts of Alternative A, Alternative B, and the Proposal. Impacts from current heavy visitation use, such as vegetation trampling, compacted soil, soil erosion, and trailing, would be reduced. Visitor experience because of new facilities, better circulation, and defined pedestrian access would contribute to an enhanced visitor experience. Visitor resource impacts would be reduced, circulation improved, and use areas defined.

Concession tour use of the monument would be increased from 23 percent to 50 percent of capacity under each alternative.

Impact of the Proposal. Visitors to the monument would have their group experience improved most under the proposal. The management exercised under the proposal,

Table 3
Scenario #1 : Capital and O&M Cost Recovery
Under this scenario the government would recover
capital and O & M cost.**

Capital Cost	
Equipment	$560,000
Construction	$3,854,032
Total Capital Cost	$4,414,032
FTE (16.6)Cost ***	$370,892
Supplies ***	$247,235
Gas/Oil	$128,000
Repair/engine replmt.	$138,600
O&M Cost #	$884,727
Annual Cost	

At 10% Interest

O& M Cost #	Capital Cost Recovery 30 yrs. @ 10% Payment Monthly	Yearly****	Total Debit
$884,727	$38,736	$464,835	$1,349,562

At 7% Interest

O& M Cost #	Capital Cost Recovery 30 yrs. @ 7% Monthly	Yearly****	Total Debit
$884,727	$29,367	$352,400	$1,237,127

Monument Capacity
390 persons at one time

Six Month Season*: 561,600 visits

Eight Month Season*: 748,800 visits

		Six Month Season*		Revenues from Ticket Sales			Eight Month Season*		Revenues from Ticket Sales		
				Tickets Priced at					Tickets Priced at		
Year	Visits*****	Distribution 85% of Total Visits	Visitation Minus(23%) Tour Boats ******	$6	$7	$8	96% of Total Visits	Visitation Minus(23%) Tour Boats ******	$5	$6	$7
1988	238,307	202,560	155,971	$935,826	$1,091,797	$1,247,768	228,774	176,155	$880,775	$1,056,930	$1,233,085
1989	268,866	228,536	175,972	$1,055,832	$1,231,804	$1,407,776	258,111	198,745	$993,725	$1,192,470	$1,391,215
1990	285,847	242,969	187,086	$1,122,516	$1,309,602	$1,496,688	274,413	211,298	$1,056,490	$1,267,788	$1,479,086
1991	302,635	257,239	198,074	$1,188,444	$1,386,518	$1,584,592	290,529	223,707	$1,118,535	$1,342,242	$1,565,949
1992	314,866	267,636	206,079	$1,236,474	$1,442,553	$1,648,632	302,271	232,748	$1,163,740	$1,396,488	$1,629,236
1993	334,803	284,582	219,128	$1,314,768	$1,533,896	$1,753,024	321,410	247,485	$1,237,425	$1,484,910	$1,732,395
1994	350,378	297,821	229,322	$1,375,932	$1,605,254	$1,834,576	336,362	258,998	$1,294,990	$1,553,988	$1,812,986
1995	365,013	310,261	238,900	$1,433,400	$1,672,300	$1,911,200	350,412	269,817	$1,349,085	$1,618,902	$1,888,719
1996	373,758	317,694	244,624	$1,467,744	$1,712,368	$1,956,992	358,807	276,281	$1,381,405	$1,657,686	$1,933,967
1997	401,886	341,603	263,034	$1,578,204	$1,841,238	$2,104,272	385,810	297,073	$1,485,365	$1,782,438	$2,079,511
1998	415,817	353,444	272,151	$1,632,906	$1,905,057	$2,177,208	399,184	307,371	$1,536,855	$1,844,226	$2,151,597
1999	429,935	365,444	281,391	$1,688,346	$1,969,737	$2,251,128	412,737	317,807	$1,589,035	$1,906,842	$2,224,649
2000	446,020	379,117	291,920	$1,751,520	$2,043,440	$2,335,360	428,179	329,697	$1,648,485	$1,978,182	$2,307,879

* Average distribution patterns for the last 10 years show that a six month season is about 85% of total visitation and an eight month season is about 96% of total visitation.
** All costs are calculated using 1989 costs.
*** O&M costs are shown for 60% salary and 40% supplies. FTE salary estimates cost are based on a GS-5 step 5 CRS employee.
**** Principal and interest repayment for 30 year fixed financing.
*****Projections for future visits based on linear regression of 1979-1988 NPS visitation data.
******Tour boats account for approximately 23% of total visitation at Rainbow Bridge.
*******Based on operating 8 hours per day 7 days a week

Table 4
Scenario #2 : Recovery of O&M Costs
Under this scenario the government would recover
O & M costs.**

Capital Cost	
Equipment	$560,000
Construction	$3,854,032
Total Capital Cost	$4,414,032
FTE (16.5)Cost ***	$370,892
Supplies ***	$247,235
Gas/Oil	$128,000
Repair/engine replmt.	$138,600
O&M Cost	$884,727
Annual Cost	

		Six Month Season			Revenues from Ticket Sales		Eight Month Season			Revenues from Ticket Sales	
Monument Capacity ******* 390 persons at one time		561,600 visits					748,800 visits				
		Distribution	Visitation					Visitation			
		85% of	Minus(23%)		Tickets Priced at		96% of	Minus(23%)		Tickets Priced at	
Year	Visits*****	Total Visits	Tour Boats ******	$4	$5	$6	Total Visits	Tour Boats ******	$3	$4	$5
1988	238,307	202,560	155,971	$623,884	$779,855	$935,826	228,774	176,155	$528,465	$704,620	$880,775
1989	268,866	228,536	175,972	$703,888	$879,860	$1,055,832	258,111	198,745	$596,235	$794,980	$993,725
1990	285,847	242,969	187,086	$748,344	$935,430	$1,122,516	274,413	211,298	$633,894	$845,192	$1,056,490
1991	302,635	257,239	198,074	$792,296	$990,370	$1,188,444	290,529	223,707	$671,121	$894,828	$1,118,535
1992	314,866	267,636	206,079	$824,316	$1,030,395	$1,236,474	302,271	232,748	$698,244	$930,992	$1,163,740
1993	334,803	284,582	219,128	$876,512	$1,095,640	$1,314,768	321,410	247,485	$742,455	$989,940	$1,237,425
1994	350,378	297,821	229,322	$917,288	$1,146,610	$1,375,932	336,362	258,998	$776,994	$1,035,992	$1,294,990
1995	365,013	310,261	238,900	$955,600	$1,194,500	$1,433,400	350,412	269,817	$809,451	$1,079,268	$1,349,085
1996	373,758	317,694	244,624	$978,496	$1,223,120	$1,467,744	358,807	276,281	$828,843	$1,105,124	$1,381,405
1997	401,886	341,603	263,034	$1,052,136	$1,315,170	$1,578,204	385,810	297,073	$891,219	$1,188,292	$1,485,365
1998	415,817	353,444	272,151	$1,088,604	$1,360,755	$1,632,906	399,184	307,371	$922,113	$1,229,484	$1,536,855
1999	429,935	365,444	281,391	$1,125,564	$1,406,955	$1,688,346	412,737	317,807	$953,421	$1,271,228	$1,589,035
2000	446,020	379,117	291,920	$1,167,680	$1,459,600	$1,751,520	428,179	329,697	$989,091	$1,318,788	$1,648,485

* Average distribution patterns for the last 10 years show that a six month season is about 85% of total visitation and an eight month season is about 96% of total visitation.
** All calculations are made using 1989 dollars
*** O&M costs are shown for 60% salary and 40% supplies. FTE salary estimates cost are based on a GS-5 step 5 CRS employee.
*****Projections for future visits based on linear regression of 1979-1988 NPS visitation data.
******Tour boats account for approximately 23% of total visitation at Rainbow Bridge.
*******Based on operating 8 hours per day 7 days a week

interpretation done aboard the shuttle, and personal services at the monument would significantly decrease visitor to visitor conflicts. Staff believes that group satisfaction should be the highest under this alternative, while the freedom of visitors to choose activities would be restricted.

Tour boats would be restricted to 195 PAOT and monument capacity would be 390 PAOT. Based on analysis shown in the Description of this section, the shuttle would be economically feasible, whether operated by the National Park Service or a concessioner. However since visitation would likely decrease when fees are imposed, the proposal calls for the completion of a market study prior to the implementation of Phase II providing close estimates of visitation at various ticket prices. Scenario 1 shows both the potential for profit and the risk of loss, if visitation projections are not realized. In addition, private operations would allow other advantages such as depreciation, not considered in this analysis. Should the shuttle be operated as a concession, the Navajo Tribe would have first right of preference.

Impact of Alternative A. Visitors to the monument would have their group experience improved the least under this alternative. Some personal services at the monument would decrease visitor to visitor conflicts. Most would probably remain because this alternative allows for little management of group actions. Staff believes that overall group satisfaction would show a small increase from the no-action alternative, while the freedom of visitors to choose activities would be maintained.

Tour boats would be restricted to 195 PAOT and monument capacity would be 390 PAOT.

Impact of Alternative B. Visitors to the monument would have their group experience improved. Personal services at the monument would decrease visitor to visitor conflicts. The visual separation of boats from the monument and wayside exhibit entry would improve the ability of management to deal with groups of visitors. The long dock may decrease the experience of older visitors and persons with disabilities, because of a lengthy walk required in a hot climate to view Rainbow Bridge. Staff believes that overall group satisfaction would be improved, while some of the freedom visitors have to choose activities would be maintained.

Tour boats would be restricted to 240 PAOT and monument capacity would be the largest of all alternatives--480 PAOT.

Visitor Safety

Description. According to a summary of visitor safety for 1988, submitted by park staff (Visitor Safety Summary, Glen Canyon NRA staff, 1988), there were a variety of visitor safety or law enforcement incidents. These occurred within the monument and within Forbidding Canyon, which accesses the monument. Incidents vary from minor medical assistance to boating accidents. The predominant visitor safety problem was swamping of smaller boats caused by larger boats going too fast within the narrow channel, causing large wakes. Inexperience of private rental boat operators also creates a potentially hazardous environment for loading and unloading passengers. Additionally, park rangers responded to incidents involving minor injuries that resulted from the condition of the land access trail. Although, there is no documented proof that a serious visitor safety problem exists, park management feels that all the ingredients (such as narrow canyon access and restricted land access) are present for visitor safety to become a problem in the future, as visitation increases.

In addition, categories previously mentioned that can affect visitor safety include rockfall hazard and flash flooding. For full discussions of these topics and associated impacts of alternatives, see pages 63 and 68 respectively.

Impact of the No-Action Alternative. The potential for accidents would remain.

Impact of the Proposal. Regulation of boating within the channel through use of a shuttle during peak season and a wakeless zone off-season, would decrease the potential for accidents. Increased management of visitors, visitor awareness and staffing at the monument should reduce the potential for accidents.

Impact of Alternative A and Alternative B. A wakeless zone would decrease the potential for accidents and increase visitor safety. Increased visitor awareness and staffing at the monument should reduce the potential for accidents.

CULTURAL RESOURCES

Archeological Resources

Description. There are two aspects to cultural resources within Rainbow Bridge--its importance from an archeological standpoint and its importance to living American Indians.

> **Archeological Resources.** Detailed archeological investigations were not made until the 1950s. Surveys done between 1952 and 1956 recorded 11 prehistoric sites located near Rainbow Bridge. Most were small habitation dwellings. Two sites were excavated in the 1950s.
>
> In 1985, archeologists from Northern Arizona University (*Archeological Survey in the Glen Canyon National Recreation Area: Year 1 Descriptive Report, 1984-1985*) intensively surveyed 100 acres of the monument. As a result of this survey, eight archeological sites (42SA17328 through 42SA17335) and three isolated finds (IF-UT-V-13-007 through IF-UT-V-13-009) were recorded in a 70-acre area of the monument. Of the eight sites recorded, six of the sites are thought to be eligible for inclusion on the National Register of Historic Places according to the criteria in 36 CFR 60.4. Some of these sites are readily accessible to visitors at the monument and their locations will have a bearing on placement of facilities and regulation of visitor use. The 60 acres on the cliff tops of the monument still need to be surveyed, but are outside of the area where trails and other facilities exist, or are proposed.

Structures are defined as works of humans consciously constructed to serve some form of human activity. The structures are usually immovable by nature or design. There are no structures in the monument. Physical remains of early historic use along the Colorado River have all been inundated by Lake Powell. Physical remains of the Rainbow Lodge, and other structures along the Rainbow Trail are located outside of the monument. However, numerous early registers from the lodge are currently in possession of the park. Plaques dedicated to the "discovery" party have been placed along the trail within the monument boundary.

Museum Collections. Glen Canyon NRA has a small collection of historic photographs and documents about the history of Rainbow Bridge and its visitors. The Rainbow Bridge photographic collection needs to be organized and cataloged and segregated from the Glen Canyon collection. The majority of the documents have already been cataloged and approximately 20 historic documents about Rainbow Bridge are currently stored as museum objects.

The photographic collection is currently located at the Wahweap District Ranger's office and is in fair condition. None of the collection is stored in compliance with Special Directive 80-1, and it is expected that substantial deterioration of the photos will be revealed when they are finally examined and their storage is upgraded. The historic documents range in condition from poor to good.

A Scope of Collections Statement also needs to be prepared to identify possible additions to the Rainbow Bridge museum collection. It is probable that the need for acquisition of historic and ethnographic documents, files, and historic photographs will be identified.

Ethnographic Overview. Ethnographic resources, in this context, are defined as park resources, which have traditional subsistence, sacred ceremonial or religious, residential, or other cultural meaning for members of contemporary park-associated ethnic groups, including American Indians.

Rainbow Bridge is important to some Indians, especially the Navajos of the Navajo Mountain Chapter, for traditional and ceremonial rites. Park and staff archeologist have concluded that some twentieth-century Navajos and San Juan Paiutes, influenced by the Navajos, consider Rainbow Bridge to be a sacred place. There is evidence that veneration of Rainbow Bridge is an elaboration of a traditional Navajo attitude toward all natural arches and bridges.

The monument is occasionally used by individuals from the Navajo Tribe for religious ceremonies near the bridge. Currently there is visitor impact in the immediate area of the bridge itself. Surveys were taken by the staff of the Glen Canyon NRA during 1988 to study the significance of the area to Indian people and inventory contemporary uses. The surveys were confined to present and former residents of the Navajo Mountain Chapter of the Navajo reservation. Most Navajos visit the bridge using the natural land trail either on foot or on horse. Since the Navajo culture considers itself to be living with nature, all things that nature has made are considered sacred. For Indians, Rainbow Bridge should be kept in as much of a natural setting as possible. Known in the Navajo tongue as Tsi-Na-Ne-Ah (meaning arch rock or rock bridge), Rainbow Bridge is considered to be the most significant of natural bridges in the area due to its relationship and westerly proximity to Navajo Mountain. Ceremonies are private and passed on from generation to generation. Additional ethnographic study is needed to better understand the religious significance to and traditional uses of the monument by American Indians.

In 1981, the Tenth Circuit Court of appeals rendered an opinion in favor of the United States in Lamar Badoni, *et al.*, v. R. Keith Higginson, 10th Cir. No. 78-1517, turning down plaintiff's contention that tourists were desecrating American Indian sacred sites and preventing them from accessing these sites so they could conduct religious ceremonies. The merits of the case were not argued using the American Indian Religious Freedom Act. Because of the private nature of ceremonies, the exact religious significance of the bridge to American Indians has never been clear to non-Indians. Regardless, the National Park Service must manage the monument in such a manner that it does not interfere with an Indian group's use of traditional sites or sacred objects.

Impact of the No-Action Alternative. Cultural resource sites would continue being disturbed and damaged through unrestricted access by visitors. Visitors could continue to climb, touch, and degrade petroglyphs on canyon walls. Although Indian access is maintained at the monument, no specific recognition of the importance of Rainbow Bridge to the Navajo Tribe has been made.

Currently unknown archeological resources adjacent to, or easily accessible from, active recreational areas would be vulnerable to surface disturbance, inadvertent damage, and vandalism. A loss of the surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence would result. Resources in these areas could be vulnerable to both inadvertent disturbance and deliberate and illicit disturbance in the form of digging and collecting of archeological materials.

Impact of Alternative A, Alternative B and the Proposal. The construction of congregating areas and low-impact trails could destroy currently unknown archeological resources if inadvertently unearthed during construction. The likelihood of this happening will be minimized through mitigation measures described in the proposal. Construction activities would affect the uppermost layers of the earth as machines compact the soils and alter the horizontal and vertical distribution of buried archeological remains. These activities could also destroy surface sites by damaging and destroying artifactual remains and their contextual environments.

Cultural resource sites would be maintained and preserved. Cultural site maintenance management would restrict visitor access to the defined low-impact trail, and provide maximum interpretation and enforcement via ranger presence during normal hours of operation at the monument.

Indian rights would be considered in management of the monument. Indian access under the proposal would provide the maximum amount of interpretation of cultural themes; allow permitted access to the monument by American Indians for religious reasons; locate memorials in an appropriate interpretive area so they can be viewed and appreciated by all visitors; and provide assistance and require review/approval of the Director before permanent placement of memorials in the monument area. The monument would be closed to the public on one day during the off-season each year to recognize American Indians. The day would be determined by the superintendent and the monument closed by his order. No development would be permitted underneath the bridge. Information would be made available to local chapter houses on the exact hours that the monument would be open for operations.

SUMMARY OF THE ENVIRONMENTAL CONSEQUENCES

IMPACT	PROPOSAL	ALTERNATIVE A	ALTERNATIVE B	NO-ACTION
Land Status	Affect Parcel "B" lands.	No effect.	No effect.	No effect.
NATURAL RESOURCES				
Geology and Soils				
Geologic Stability	Monitoring would continue. No effect.	Same as proposal.	Same as proposal.	Same as proposal.
Rockfall Hazard	Reduction of risk to visitors from rockfall.	Same as proposal.	Same as proposal.	BOR recommendations would not be implemented. Threat to visitors from rockfall would remain.
Soils	Temporary effects from construction.	Same as proposal.	Same as proposal.	No effect.
	Reduction of compaction and soil erosion from construction of a low-impact trail.	Same as proposal.	Same as proposal.	Continued soil compaction and erosion from heavy visitor use.
Vegetation	Reduction in vegetation trampling from off-trail visitor use and rehabilitation of areas with damaged vegetation.	Same as proposal.	Same as proposal.	Elimination of vegetation in some areas and shift in species composition in others.
	Tamarisk would be removed.	Same as proposal.	Same as proposal.	Tamarisk would eventually obstruct the view of Rainbow Bridge.
Flood Plains & Wetlands	No developed areas in 100/500-year floodplain.	Same as proposal.	Same as proposal.	Same as proposal.
Flash Floods	Reduction of risk to visitors from flash floods from implementation of Flash Flood Mitigation Plan. The maximum number of persons at risk from flash floods is 390.	Same as proposal.	Same as proposal except that the maximum number of persons at risk from flash floods is 480.	Continued risk to visitors from the effects of a flash flood. The maximum number of persons at risk from flask floods is unlimited.
Water Resources				
Fluctuating Lake Levels	10% chance of elimination of access for disabled to the monument.	Same as proposal.	Same as proposal.	Same as proposal.
Water Quality & Pollution	Temporary increase in sediment and water turbidity during construction.	Same as proposal.	Same as proposal.	No effect.
	Pollution from boats would be reduced.	Pollution from boats would continue.	Pollution from boat motors inside the monument would decrease, but a small increase would occur at the dock.	Same as Alternative A.
Air Quality	Reduction of dust levels at the monument from visitor use on undefined trails.	Same as proposal.	Same as proposal.	No reduction in dust levels.
Noise	Boat and visitor noise reduced. Boat noise at transfer dock would be in line with other marinas on Lake Powell.	Boat and visitor noise would be reduced slightly.	Boat and visitor noise would be reduced.	No reduction in boat and visitor noise.

IMPACT	PROPOSAL	ALTERNATIVE A	ALTERNATIVE B	NO-ACTION
Wildlife	Reduction in wildlife disturbance.	Reduction in wildlife disturbance.	Reduction in wildlife disturbance.	No reduction in disturbance to wildlife.
Threatened & Endangered Species	No effect on the bald eagle, peregrine falcon, humpback chub, bonytail chub, Colorado squawfish, yellow-billed cuckoo, or the ferruginous hawk.	Same as proposal.	Same as proposal.	Same as proposal.
SOCIOECONOMIC ENVIRONMENT				
Regional Economy	Improved recreational opportunity.	Same as proposal.	Same as proposal.	Deteriorating recreation opportunity.
Visual Resources	Preservation of the natural scene.	Same as proposal.	Same as proposal.	Deterioration of the natural scene from uncontrolled tamarisk and continued trailing and erosion from use on undefined trails.
Visitor Use/Experience	Impacts of high use would be reduced and circulation improved.	Same as proposal.	Same as proposal.	Continued impacts from high use.
	Visitor experience would be enhanced.	Same as proposal.	Same as proposal.	Visitor experience likely to decrease.
	Group experience improved and visitor/visitor conflicts reduced.	Group experience improved slightly with a small reduction in visitor/visitor conflicts.	Group experience improved with a moderate reduction in visitor/visitor conflicts.	Group experience not improved. No reduction in visitor/visitor conflicts.
	Individual freedom of choice of activities restricted.	Individual freedom of choice of activities maintained.	Some individual freedom of choice of activities maintained.	Individual freedom of choice of activities maintained.
Concession Tour Boats/Monument Capacity	Monument capacity 390 PAOT during the shuttle season and 290 PAOT during the off-season. Tour boats allocated 50% of capacity - 195 PAOT.	Monument capacity 390 PAOT. Tour boat allocated 50% of capacity - 195 PAOT.	Monument capacity 480 PAOT. Tour boats allocated 50% of capacity - 240 PAOT.	Undefined.
Economic Feasibility of Shuttle Transportation	Economically feasible for NPS operation without Government subsidy at $6 per person.	No effect.	No effect.	No effect.
Visitor Safety	Channel regulation of boating would decrease the potential for boating accidents. Increased management would increase visitor safety.	A wakeless zone would decrease the potential for boating accidents. Increased visitor awareness and monument staffing would increase visitor safety.	Same as A.	There would be no change in current conditions.
CULTURAL RESOURCES				
Archeological Resources	Restriction of visitors to defined trails would reduce the potential for inadvertent loss of archeological resources.	Same as proposal.	Same as proposal.	Inadvertent loss of archeological resources from unrestricted visitor access would remain.
	Cultural resource sites would be maintained and preserved.	Same as proposal.	Same as proposal.	Conditions would remain unchanged.
	Indian concerns would be provided for through a number of management actions.	Same as proposal.	Same as proposal.	No provisions for American Indians.

CONSULTATION

During the preparation of this document the National Park Service consulted with the following organizations and individuals:

- Advisory Council on Historic Preservation
- Bureau of Reclamation
    - Glen Canyon Dam Office, Page, Arizona
- Chamber of Commerce, Page, Arizona
- Federal Emergency Management Agency
    - Denver Office, Denver, Colorado
- Kane County, Utah
    - Building Inspector Office, Kanab, Utah
- Midwest Archeological Center
- National Park Service, Denver Service Center
    - Denver Service Center, Denver, Colorado
        - Mr. Robert Yearout
    - Water Resources, Fort Collins, Colorado
        - Mr. Gary Smillie
    - Regional Solicitor, National Park Service
    - Rocky Mountain Region, Denver, Colorado
        - Mr. Michael Le Borgne, Chief, Branch of Construction
        - Dr. Michael Schene, Historian
        - Mr. Ron Everhart, Chief, Concessions Management
        - Mr. Mike Cumiskey, Concession Specialist
        - Mr. Michael Snyder, Chief, Planning and Compliance
        - Ms. Chris Turk, Chief, Branch of Compliance
        - Mr. Wayne Gardner, Chief, Branch of Planning
- State of Utah
    - State Historic Preservation Office (SHPO)
    - State Travel Commission, Utah
- U.S. Fish and Wildlife Service
    - Utah State Office

Pursuant to the Endangered Species Act, the National Park Service requested a list from the U.S. Fish and Wildlife Service, of threatened and endangered species that might be affected by the plan. Impacts have been analyzed and *concurrence with the determination of no adverse effect will be sought from the Fish and Wildlife Service.*

The NPS is also consulting with the state historic preservation officers and the Advisory Council on Historic Preservation in the preparation of this plan pursuant to a programmatic memorandum of agreement.

A scoping brochure listing planning issues was distributed to agencies, organizations and individuals for public review and comment during November 1988. Comments were received and used to help develop alternatives and refine planning issues.

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APPENDIX A

CARRYING CAPACITY

CARRYING CAPACITY
OF RAINBOW BRIDGE NATIONAL MONUMENT

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PURPOSE OF CARRYING CAPACITY

Introduction

Carrying capacity alone will not solve the problems of the monument. The establishment of carrying capacity is important only when part of a broader solution, as defined within the context of the planning alternatives. When part of a broader solution, carrying capacity is important for controlling adverse impacts to natural and cultural resources from too much visitor use and improving the recreation experience of the monument visitor. Preservation of the monument's resource and providing for the enjoyment of the monument by the American people are now on conflicting courses. The primary reason for establishment of the monument was for its representation of an extraordinary natural bridge and its value as an example of eccentric stream erosion. The proposal and the alternatives must walk a fine line in resolving the issues of both protection of the resource and management of the monument for the enjoyment of the people. One tool management has to balance protection and preservation with enjoyment is carrying capacity limits. Because of the physical constraints of the monument, limiting carrying capacity is an effective method to help resolve this issue.

Providing an enjoyable recreation experience does not just rely on carrying capacity. "Recreation experiences involve a combination of setting characteristics, social behavior, and individual consciousness. Shared evaluative guidelines, called social norms, help define what is appropriate for different kinds of experiences." (Shelby, 1986) In addition, use levels and contacts do not necessarily correlate to user satisfaction. "Satisfaction is a broad psychological construct; the number of other people is only one of many things that might affect it....As a result, a satisfying recreation experience may occur even when use levels are high. Conversely, you can have a miserable time in spite of minimal contact if it rains on your leaky tent or you destroy your boat by tipping over in a rapid." Perceived crowding is affected by the personal standards people bring with them and the way they define the setting they are in. The question that needs to be evaluated in managing outdoor recreation is one of not only numbers of visitors because of the limited size of the monument, but regulation of visitor behavior and individual choice that affect personal standards.

Using a Behavioral Approach

Setting a capacity for Rainbow Bridge National Monument, then, is only one element of the multi-faceted approach used by this plan in managing it as a recreation resource. The plan's strength lies in using a "behavioral approach with both direct and indirect controls. Interpretation of outdoor recreation has evolved from an 'activity approach' to a 'behavioral approach' which focuses on why people participate in recreation activities and the experiences gained from such participation." (Manning, 1986) Direct tactics are defined as having a high degree of control; an emphasis on regulation of behavior; individual choice restricted. Limiting access and carrying capacity are two elements that fall into this category. Indirect tactics can be defined as having an emphasis on influencing or modifying behavior, individual retains freedom to choose; control is less complete, more variations in use are possible. These include the interpretive aspects of the proposal. Both direct and indirect management tactics are employed at the monument. Setting carrying capacity is use of a direct control.

The goal of establishing a carrying capacity for Rainbow Bridge is not to provide an experience of solitude at the monument during the peak visitor season. Rather the goal of determining a capacity for the area is to establish a reasonable limit, which in the view of park management, would control resource impacts from overuse and help to provide a pleasurable experience for visitors. Rainbow Bridge is a national and international attraction drawing over 200,000 visitors yearly. The majority come within a six month season. During that time, resource damage from overuse can occur along with a reduction in visitor experience due to the volume of visitor activity in confined spaces. Visitors seeking remoteness and solitude at Rainbow Bridge can find this type of experience during the off-season.

DETERMINING CARRYING CAPACITY

Introduction

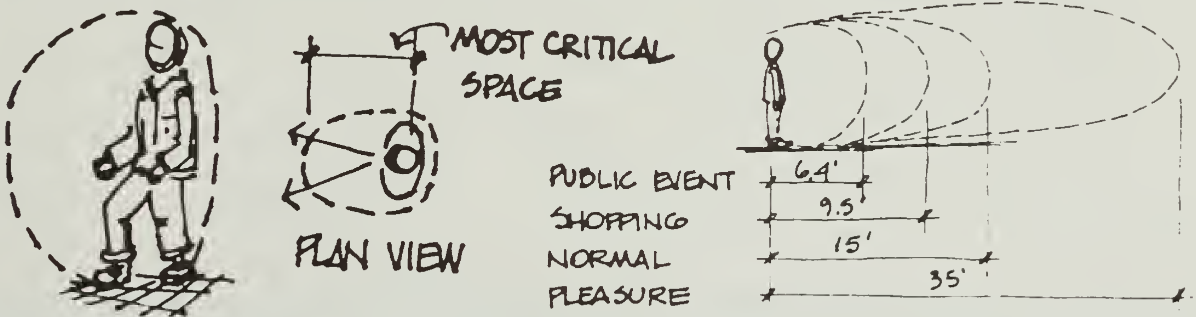
Carrying capacity at the monument is based on the interdisciplinary team's best estimate for improving visitor experience on the limited space of a narrow, low-impact trail system. The monument is accessed by land and water. Since land access is difficult, time-consuming, and accounts for a minimal amount of visitation, water access has the greatest effect on helping to protect monument resources by controlling impacts caused by too many visitors. Therefore, carrying capacity estimates were calculated for water access only.

There are three aspects of carrying capacity calculations considered by the plan--capacity of the trails and dock walkway for visitors, capacity of the boat dock for boats and visitors, and capacity of the channel for boats and visitors. These estimates provide the basis for calculations done under each alternative. For example, if an alternative has 2,000 linear feet of trails the carrying capacity of the trail would be 2,000 lf x .151 Persons at One Time (PAOT)/lf = 300 PAOT (see coefficient calculation below). To calculate the total carrying capacity for the monument under any alternative then, all three aspects of carrying capacity are calculated and the most limiting of the three elements is used to establish the carrying capacity of the monument for that alternative.

Carrying Capacity - Trails and Dock Walkway

The monument area that can be accessed on land by the visitor is less than one percent of the monument land area. Land access is based on physical design standards for a linear trail system and congregating areas. Spacing and activities were matched to visitor experience. Included in this is a scheme that recognizes space requirements for visitor activities and group size.

Trails and Walkway. Design standards have been established for estimating space requirements of persons participating in some recreation activities. The Handbook of Landscape Architecture made the following estimations (Unterman, 1976, pp 23-24):



This shows a 35' bubble space required for one person who is walking for pleasure. Based on staff observation, the interdisciplinary team determined that visitors to the area usually travel in groups. According to a carrying capacity study done for Lake Powell in 1987, the average party size for this area is 8. Assuming a party size of 8, with each party walking 2 abreast in a group with 6' between each pair, estimates were calculated for persons at one time per linear foot of trail or dock walkway. This is shown in the following diagram.

: 6' : 6' : 6' : 35' : 6' : 6' : 6' :

$C = P/L$

Where C is the persons at one time (PAOT) per linear foot of trail or dock walkway.
P is party size
L is total distance between parties

$$C = \frac{8 \text{ persons}}{53' \text{ linear feet}}$$

Persons at one time for each linear foot of walkway is 8/53 or .151/LF of trail/walkway.

Interpretive Areas. The interdisciplinary team assumed that each interpretive area could accommodate three parties (3 x 8 = 24 PAOT) and that four parties could occupy the interpretive dock area (4 x 8 = 32 PAOT).

Carrying Capacity of Existing Dock

The space inside the monument that can be used for dock area is limited because of physical constraints, the fluctuating water level, and the desire of park management to keep the boat area as far away from Rainbow Bridge as possible. The capacity for the dock could be changed by a new slip design and making other small modifications to dock configuration. For the purposes of these estimates, however, calculations are based on the existing dock. Estimates were based on the following:

Private boat decking = 610 LF
Average boat length = 30 ft
610/30 = 20 boats at one time (BAOT)
Private boats 20 x 8 = 160 PAOT
Tour boats 2 per 30 min period = 130 PAOT
TOTAL EXISTING CAPACITY = 290 PAOT

Carrying Capacity - Water Channel

The capacity of the channel from the mouth of Forbidding Canyon to the monument was examined. The interdisciplinary team found after calculations that the channel capacity for no wakeless zone was about 210 BAOT or 1,680 PAOT and that this exceeded existing dock and proposed trail capacities. Thus this was not limiting in comparison with the two other aspects of carrying capacity and was not a factor in the final determination of carrying capacity under any alternative. The following assumptions were used:

Channel length = 18,900 ft.
Average channel width = 400 ft.
Two channel---one in and one out
Average boat length = 30 ft.
Average boat spacing = 150 ft.
Center to center boat spacing of 180 ft.

18,900 x 2 lines (one in, one out) = 37,800 ft
37,800/180 = 210 BAOT
210 BAOT x 8 per party = 1,680 PAOT (This ignores tour boats.)

APPENDIX B

INTERPRETIVE PROSPECTUS

Rainbow Bridge

NATIONAL MONUMENT

INTERPRETIVE PROSPECTUS 1990

TO THE FOOT OF THE RAINBOW

...Around the first bend in the canyon we saw it--Nonne-zoche Not-se-lid, the incomparable, the indescribable.

It was hard to believe that this thing was of hard cold stone. In the setting sun it was warm, radiant, glorious...

We crept closer. We found that we had not realized the great size of the arch, for it is so wonderfully graceful and so perfectly proportioned that its beauty rather than its colossal size first engages the attention. One could place the Capitol under it, however, and then have considerable room...

For hours we walked and sat and looked. Hardly a word was said. At last we slept. At the foot of the Rainbow, we had not found the pot of gold, but content and happiness.

-- Clyde Kluckhohn
To The Foot Of The Rainbow
The Century Company, New York, 1927

On May 30, 1910, President William H. Taft proclaimed the Rainbow Bridge a national monument. The words of that proclamation still provide the basis for all National Park Service efforts to preserve and interpret the significance of this most impressive masterpiece in stone.

> ... an extraordinary natural bridge, having an arch which is in form and appearance much like a rainbow, and which is three hundred and nine feet high and two hundred and seventy-eight feet span, is of great scientific interest as an example of eccentric stream erosion, and it appears that the public interest would be promoted by reserving this bridge as a National Monument, together with as much land as may be needed for its protection...

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INTERPRETING RAINBOW BRIDGE

Rainbow Bridge warrants protection not only for its geological significance but also because of its unique natural beauty. The vast majority of visitors to the bridge first glimpse the soaring structure from the waters of Lake Powell that have backfilled Bridge Canyon up to and under the span. From the wide expanse of Lake Powell's main channel, visitors travel through the ever-narrowing Forbidding Canyon and the even more restrictive Bridge Canyon.

Since access to the monument is primarily by boat from the Lake Powell corridor, responsibility for the bridge's preservation and interpretation was placed with Glen Canyon National Recreation Area. However, increasing visitation facilitated by Lake Powell's easy access has accelerated wear and tear on the monument's resources. Furthermore, visitors accustomed to Lake Powell's recreational opportunities, have expanded the pursuit of these opportunities, such as swimming and rock-climbing, to the bridge. The National Park Service thus was confronted with visitors to Rainbow Bridge who did not recognize the monument as having values separate from and distinct from neighboring Glen Canyon.

The General Management Plan addresses the need to rid the monument of conflicting visitor uses by prescribing control of visitor access. The contact station and tour boat interpreters in Phase I and the shuttle boat system in Phase II provides an opportunity for interpreters and personal services to redirect visitor attention from recreational pursuits to viewing the world's largest natural bridge. This 15-minute transitional period, comparable in some ways to the mood-setting waiting areas used by many theme parks in the United States, helps prepare the visitor for a fuller appreciation of Rainbow Bridge, and for a better understanding of what makes it different from the Glen Canyon National Recreation Area.

Controlled access will provide a consistently high-quality introduction to the monument by NPS Interpreters, that will offer visitors information basic to understanding and appreciating the geological processes that created Rainbow Bridge; the bridge's niche in the Colorado Plateau; and man's interaction with the bridge from pre-Columbian times, to the present. An important aspect of the contemporary story is the impact on the monument's ecosystems resulting from the impoundment of Lake Powell. Additionally, visitors will have a heightened safety awareness while in the area, and will be exposed to the park preservation ethic and the role that an individual can play in it.

Controlled access will also allow park interpreters to emphasize the sacredness attached to the span by nearby American Indians. By having such information, visitors hopefully will approach the bridge with a greater appreciation of American Indian beliefs about the site. Ranger-conducted groups will reduce some of those activities, which in the past, have been most offensive to American Indians. Furthermore, these efforts by the Park Service will be indicative of the Service's sensitivity to American Indian religious beliefs, which traditionally are associated with places, objects, and seasons.

ARA Leisure Services, Inc., and the Glen Canyon Natural History Association will have an opportunity to better coordinate the total visitor experience. Such cooperation will guarantee the availability of NPS interpreters at the Forbidding Canyon Transfer Dock for the Park Service shuttle and all commercial tours to the bridge. The mix of personal services, waysides, and printed materials offered by the Service and the Natural History Association, at the Forbidding Canyon facility, will focus visitor attention on the monument, thereby enhancing appreciation of the monument and reducing negative impacts on monument resources.

Interpretation at Rainbow Bridge will improve visitor experience by:

> Providing interpretive programs and facilities that meet National Park Service standards for accuracy and quality.
>
> Nurturing cooperative interpretive efforts involving ARA Leisure Services, Inc., the Glen Canyon Natural History Association, and the National Park Service.
>
> Providing interpretation of all park resources: natural history, human history, and the National Park System.

THEMES, GOALS AND OBJECTIVES

THEMES

Geological Processes That Formed the Bridge

Entrenched stream meandering and conchoidal fracturing were the two major factors in forming the largest natural bridge on earth. Recognized as a world class example of such geologic phenomena, Rainbow Bridge has been protected by the Federal Government since 1910.

Rainbow Bridge: Part of the Larger Colorado Plateau Ecosystem

The monument's riparian, blackbrush, and desert scrub communities are three distinct plant zones found throughout the Colorado Plateau. In addition, its diverse populations of mammals, birds, reptiles, insects, and other animal species are representative of the Colorado Plateau.

People Have Interacted with the Bridge in Prehistoric Times

Archeological features are evidence of pre-Columbian people living in the area, with the earliest Euro-American explorers referring to the remains of a primitive structure beneath Rainbow Bridge.

People Have Interacted with the Bridge in Historic Times

Twentieth Century Navajos and San Juan Paiutes consider Rainbow Bridge a sacred place. Contrary to claims by the 1909 Discovery Party of being the first Anglos to view the bridge, several believable accounts point to pre-1909 visits by cattlemen, miners, and trappers. However, the Douglass-Cummings parties' discovery on August 14, 1909, resulted in the first widespread publicity about the bridge.

Human Activity's Impact on the Monument

In 1971, the waters of Lake Powell, formed behind the Glen Canyon Dam, first entered the monument. By 1980, the lake reached its full pool elevation of 3,700 feet above mean sea level, and permanently altered the monument's riparian environment. Once one of the most remote areas in the United States, Rainbow Bridge is now readily accessible via Lake Powell. However, the lake's encroachment under the bridge continues to raise concerns about damage to the natural underpinnings of the structure, noise pollution from boat traffic, and degradation to the monument's resources from increasing visitation.

GOALS

To increase visitor understanding of the geology, plants, and animals of the region.

To encourage visitor understanding of how Rainbow Bridge fits into the Colorado Plateau formation and ecosystem.

To help visitors understand that different cultures perceive resources differently, i.e., some neighboring American Indians regard Rainbow Bridge as sacred.

To help visitors understand that the monument's resources do not end at its boundaries.

To generate visitor interest in the cultures and lifestyles, from prehistoric to present times, of the people of the Rainbow Bridge region.

To stimulate visitor and local citizen understanding of external threats to monument resources.

To encourage visitor understanding of limited visitor access to Rainbow Bridge as one management device for reducing degradation of monument resources.

To foster safe, informed, minimum boat and foot impact access to monument resources.

To reduce visitor injury and hazards related to monument uses.

To help visitors understand and appreciate their role in maintaining the monument's natural and cultural resources.

To enhance the visitor's experience at Rainbow Bridge by providing a pleasant transition from a recreational activity to an environmental education experience.

To foster visitor enjoyment through awareness of available activities and services and time needed for each, both within the monument and the Glen Canyon National Recreation Area.

To prevent intentional and unintentional resource degradation.

OBJECTIVES

Objectives are used to measure achievements. As we learn more about our visitors and our capabilities, these objectives may be modified. The following list is but a partial inventory of the objectives of the monument's interpretation program. Any necessary modifications and additions should be placed in the Annual Statement for Interpretation.

Of the visitors leaving the monument:

80 percent will confirm that they received adequate information for a well-informed, safe, efficient, and enjoyable visit.

80 percent will be able to describe the primary resource that warrants the area's national monument designation.

80 percent will be able to identify Rainbow Bridge National Monument as a separate National Park area, distinct from Glen Canyon National Recreation Area.

80 percent will know that the Rainbow Bridge is sacred to neighboring American Indians.

80 percent will be able to identify water erosion and fracturing as the two main factors in the formation of Rainbow Bridge.

80 percent will be able to identify at least one management measure used to reduce impacts on the monument's resources.

50 percent will be able to identify human impacts affecting Rainbow Bridge.

50 percent will be able to identify at least one action they can take to prevent degradation to the Rainbow Bridge.

50 percent will know that prehistoric people once lived in and around the monument.

INTERPRETIVE SERVICES

The use of interpretation is an important part of achieving management's goal of accommodating increasing levels of visitation to Rainbow Bridge and maintaining a quality visitor experience. Three primary forms of interpretive services will be utilized under The Plan in both phases - wayside exhibits, personal services and printed material.

PHASE I

Nonpersonal Interpretation

Interpretive Media. During Phase I, an entry contact station will be established in Forbidding Canyon. Here visitors will pay an entry fee and obtain information before continuing to the bridge in privately owned and rental boats. Since contact time will be much shorter at the contact station than at the transfer dock, to be installed at this same site in Phase II, nonpersonal interpretive services will have to be relied upon more heavily. Printed materials in the form of brochures, site bulletins, flyers, etc., will supply much of the information offered.

The printed material will contain orientation to the monument and its Forbidding Canyon/Bridge Canyon approach, differentiate between Glen Canyon National Recreation Area and Rainbow Bridge National Monument, describe how Rainbow Bridge was formed, provide insight to Rainbow Bridge's religious significance to neighboring American Indians, alert visitors to safety concerns and the monument's flash flood warning system, and list those activities that are prohibited in the monument (diving, swimming, fishing, climbing, overnight camping, etc.).

Audio cassette tape players with prerecorded interpretive programs and safety messages will also be available at the contact station for use between the station and the bridge. These recorded programs will be available in English as well as French and German to accommodate foreign visitors. Audio cassettes will not be used during Phase II, when all visitors will transfer to guided tour boats for the trip to the bridge.

A major thrust of the printed materials and audio programs will be the reinforcement of verbal instructions given at the contact station about the wakeless zone between the station and the bridge, other safety precautions to observe while traveling upcanyon, and basic information regarding the significance of Rainbow Bridge, to insure a quality visitor experience.

Wayside Exhibits. Wayside exhibits will serve as one of the three primary focuses--the other two being personal services and printed materials--to impart information to monument visitors. In deference to American Indian attitudes towards the bridge, no waysides will be installed onshore along the trail to, under, and upcanyon beyond the bridge. The only exception to this will be safety signs placed at appropriate locations along the trail to indicate hazards (signs indicating a rockfall hazard area, for example). Instead, exhibits will be located on the new floating interpretive platform on the monument dock. Two existing wayside exhibits addressing the geologic processes that formed Rainbow Bridge and the discovery of the bridge will be used at this location on an interim basis until waysides can be developed addressing the following:

> Safety messages including an explanation of the flash flood warning system and what the visitor should do in the event of a flood or flood warning.
>
> Explanation of the geological processes that formed the world's largest natural bridge.
>
> Explanation of the religious significance of the bridge to neighboring American Indians.
>
> Explanation of the monument's ecosystems as being part of the greater Colorado Plateau, with floral and faunal examples given. Problems with exotic species of fish and plants (tamarisk) should be included. Should this latter topic prove too lengthy for one wayside, then a separate exhibit on exotics should be developed.
>
> Discussion of the changes to the monument's riparian environment brought about by the waters of Lake Powell backing up into the monument.

Discussion of the ongoing monitoring of the bridge because of the concern that water at its base, during periods of high lake levels, may be weakening its natural underpinnings.

List activities prohibited in the monument--diving, swimming, fishing, climbing, overnight camping, etc.

The wayside exhibits should be developed from a standard design. Printed exhibits embedded in fiberglass, with anodized, extruded aluminum frames and mounts, are recommended.

Personal Services

Personal services interpretation for Rainbow Bridge National Monument is part of the overall interpretation program provided by Glen Canyon National Recreation Area. Interpretive services will be provided primarily in the summer season, with limited services in the off-season. The contact station in Forbidding Canyon will be staffed with employees from the Branch of Interpretation. Personal services at the contact station will include providing orientation, information, safety messages, and other visitor assistance.

For a quality visitor experience, an interpretive ranger will be on-site at Rainbow Bridge to answer visitor questions, provide assistance, perform roving, formal and informal interpretive services. An interpreter will board ARA concession tour boats and provide interpretive services for the estimated 15 minute wakeless approach to the monument. Until staffing is available for an interpreter to board the tour boats, tour boat pilots will provide the necessary information during the approach to Rainbow Bridge. The pilots will be trained and evaluated by National Park Service personnel. These programs will follow the themes, goals, and objectives outlined in this document as well as explain germane safety messages and prohibited activities. Important to this short boat ride is establishing a transition from the recreation area to the monument and creating the atmosphere for a different emotional experience.

It is recommended that employment of American Indians be maximized at Rainbow Bridge in recognition of the importance of the site to local Navajos and Paiutes. These individuals should not only have the usual interpretive skills, but also have the capacity to deal with the insensitivity of some visitors to American Indians. American Indians will more accurately portray their own lifeways and their employment will support ongoing efforts by the National Park Service to maintain positive working relations with its American Indian neighbors.

PHASE II

Nonpersonal Interpretation

Interpretive Media. During Phase II, interpretive media will not be relied upon as heavily as in Phase I because of an increase in personal services. The contact station will be expanded into a transfer dock, which will include a small indoor Natural History Association Outlet. The interpretive media provided will be much the same as in Phase I, but will include books, maps and other literature sales. Audio cassette players will not be available in Phase II, as visitors will be required to board a shuttle boat at the transfer dock and approach the bridge with an interpreter.

Wayside Exhibits. Phase I calls for the construction of an interpretive float and installation of wayside exhibits at the monument dock. In Pase II, in addition to the wayside exhibits, waysides will be located on the transfer dock.

The waysides at this locus will:

> Locate/orient the visitor in relation to the monument and the Glen Canyon National Recreation Area. This wayside should be designed so that varying shuttle boat costs and schedules can be posted. (Should the National Park Service and ARA Leisure Services agree to tour boats picking up additional passengers at the transfer dock when stopping for an interpretive ranger, schedules for these tours should also be posted). Times for return trips from Rainbow Bridge should be shown, as well as prices for the trips.
>
> Provide safety messages (depth and temperature of the water; importance ofkeeping children under close supervision; boating safety messages; the necessity for closing the canyon to visitors because of potential flooding from heavy downpours upcanyon, etc.).
>
> In the restrooms, explain how human wastes are removed from the site for treatment to reduce water pollution levels; and direct all boaters, campers, and hikers not to dump sewage and trash into Lake Powell or its tributaries; direct boaters and campers to disposal areas at the marinas.
>
> Provide information on the hiking trails between Rainbow Bridge and Navajo Mountain, including the necessity for obtaining permits from the Navajo Nation to use that segment of the trail on the Navajo Reservation. A map showing trail alignment, place names, water sources, and distances should be included. (This wayside should be moved to the floating dock at Rainbow Bridge during the off-season, when shuttle boat service is discontinued.)

Personal Services

In addition to the personal services provided in Phase I, an interpretive ranger will board the shuttle boat at the transfer dock and accompany all visitors to the monument (except those that hike in). During this 15 minute shuttle boat ride, the interpreter will provide a formal interpretive program that will introduce the visitor to the monument, establish Rainbow Bridge National Monument as a separate entity from Glen Canyon National Recreation Area, describe the geologic processes that formed the bridge, describe Rainbow Bridge as sacred to neighboring American Indians, etc.

When the visitor disembarks from the shuttle boat, he/she should have a basic understanding of the monument. Upon arrival, another National Park Service Interpreter will be roving the monument available to provide further information for the visitor. Formal interpretive programs, while not scheduled, will be available should a group express such an interest. If formal programs become a regular event, the programs will be developed to enhance the interpretive program provided on the shuttle boat. The two programs should overlap only enough to provide for continuity, and should address different themes of the monument.

OFF-SEASON

Both Phase I and Phase II address the six or seven month heavy-use season (dates to be determined by review of visitor use patterns). In the off-season, access to Rainbow Bridge will not be restricted in either Phase I or Phase II. Both private boats and tour boats will be able to directly approach the monument dock. Personal services will be limited during the short off-season. Interpretive media and wayside exhibits will still be available to provide necessary information and safety messages. An interpreter will be available for unscheduled roving interpretation at the monument.

PLANNING

To maximize coordination of message content and delivery, personal service strategies should be outlined in annual planning sessions involving ARA Leisure Services, Inc., the Glen Canyon Natural History Association, and park personnel. General summer season schedules, new program ideas and service proposals, and monitoring and evaluation procedures should derive from these planning sessions. These planning meetings should also provide a forum for identifying high priority messages on resources, events, new services, and park management concerns related to the coming season.

TRAINING

People are the key to successful interpretation, and the key to people successful in interpretation is training. The National Park Service, ARA Leisure Services, Inc., and the Glen Canyon Natural History Association, provide training for their employees that is geared to suit the needs of the employer and is directed toward service, safety and resource interpretation.

In addition, it is the responsibility of the National Park Service to provide specialized interpretive training specifically designed for concession employees and specifically aimed at interpretation in the concessioner workplace. The goal is consistent, friendly and informative contacts between concession and Natural History Association employees and the visitor.

Training should include monument resources, the National Park System, the concessioner's role, the interpreter's role, the park visitors--interactions and interrelationships, interpretive program development, themes, goals and objectives, interpretive techniques, etc.

Summer seasonal training for park staff, Natural History Association staff and concessionaires should communicate the following to all employees:

> High priority messages for the summer, as identified in mid-winter planning.
>
> Motivational reminder that all personnel in public contact positions are, in the visitors' minds, "speaking" for the park.
>
> Reiteration of park themes and goals.

This seasonal training could provide the opportunity to discuss new programs and services being offered, to consider monitoring and evaluation techniques, to receive copies of the park's Annual Statement for Interpretation, and to participate a communication skill development exercise, designed to benefit all participants.

Initial training should be coordinated with the concessioner as soon as possible. After the initial training session, the park staff and concessioner will evaluate the training to determine when it should be repeated, what improvements can be made, and whether additional employees should attend. A mid-season training may be scheduled to address strengths and weaknesses in an attempt to constantly improve visitor services. The mid-season training could be directed at preventing 'burnout' and encouraging enthusiasm. Throughout the season, on-the-job interpretive training could be conducted and should be aimed at specific topics.

MONITORING AND EVALUATION

Park and concessioner management should discuss how monitoring and evaluation should be carried out. They should determine the frequency for evaluation, criteria for quality, roles and responsibilities. Criteria for quality should be consistent with park policy, National Park Service guidelines, and should ensure overall visitor enjoyment. Evaluations should reinforce the positive aspects of an individual's program while working to improve the weak points.

NEW PROGRAMS AND SERVICES

Park staff and the concessioner should remain open to suggestions for new programs of interpretive services. Ideas should be sought from all sources. All new programs and services should be subjected to a "dry run" evaluation by park staff before they are offered to the public.

APPENDIX C
RESOURCE MANAGEMENT PLAN

RESOURCE MANAGEMENT PLAN

RAINBOW BRIDGE NATIONAL MONUMENT

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I. INTRODUCTION

PARK PURPOSE AND SIGNIFICANCE

Rainbow Bridge was set aside as a national monument by Presidential Proclamation (President William Howard Taft) on May 30, 1910. It was established to preserve the world's largest natural bridge. In 1916, the National Park Service was created and assumed administration of Rainbow Bridge. As the world's largest natural bridge, Rainbow Bridge was nominated in 1989, by the National Park Service, as a World Heritage Site (Federal Register, Vol. 54, No. 86, May 5, 1989, pages 19469-72).

The 160-acre monument is in the heart of some of the Nation's most rugged canyon country and presents a unique blend of significant natural and cultural resources. The natural bridge is 290 feet high and has a 278-foot span. It is located in the approximate center of the 160-acre monument. The bridge is considered a sacred place by the Navajos, for whom personified rainbows have stood as guardians of the universe.

ADMINISTRATION AND MANAGEMENT

The monument is administered by Glen Canyon National Recreation Area (NRA), which forms part of the boundary at its northwest corner. It is bounded on three sides by the Navajo Reservation.

Access to the monument is limited. Boaters may approach from the Forbidding Canyon and Bridge Canyon arms of Lake Powell in the Glen Canyon NRA. Hikers can access the monument via trails originating on the Navajo Reservation and tracking over Redbud Pass and into Bridge Canyon from the landward side. The nearest road is approximately 13 miles away.

Visitation to Rainbow Bridge reached 238,307 in 1989. Virtually all visitors come by private boat or public tour boat. Very few visitors access the monument by trail from Navajo Mountain. Most of the visitation occurs between April and October. In the ten year period from 1979 to 1989, annual visitation increased approximately 245 percent. Highest visitation year to date was 1987, with 316,065 visitors or a 326 percent increase over 1979.

Public use is concentrated on the trail, from the boat docking facilities to the bridge and on through the monument. Existing facilities include: 1,020 linear feet of floating walkway, a 500-foot courtesy dock, floating vault toilet, and a maintained trail, with an interpretive rest area.

All lands within the national monument are classified and managed as shown in the General Management Plan. As much as 20.4 acres of the monument may be periodically inundated by fluctuations of Lake Powell.

The proclamation establishing the park and the Organic Act of 1916 establishing the National Park Service direct the basic principles and objectives for the management of park resources. The proclamation describes the natural bridge as "extraordinary" and declares that it "...is of great scientific interest as an example of eccentric stream erosion." The Organic Act states that the purpose of national parks is "... to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

PURPOSE OF THE RESOURCE MANAGEMENT PLAN

This Resource Management Plan for Rainbow Bridge National Monument describes the natural and cultural resources preserved within the park, as well as the ongoing or potential management activities for preserving those resources. A wide variety of research initiatives, baseline studies, and manipulative and protective techniques are integrated into a comprehensive resource management program.

MANAGEMENT OBJECTIVES FOR PARK RESOURCES

The resources management objectives for Rainbow Bridge are:

1) To preserve Rainbow Bridge by such means as will leave this outstanding natural resource unimpaired for the enjoyment of present and future generations.

2) To identify, determine the significance of, and protect the natural and cultural resources within the monument.

3) To communicate, coordinate, and cooperate with the Bureau of Reclamation to insure that the management of the Lake Powell impoundment is compatible, to the greatest degree possible, with the long-term preservation of Rainbow Bridge.

4) To foster and maintain a cooperative relationship for the use and protection of the national monument with the Navajo Tribe.

II. PRESENT STATUS OF NATURAL RESOURCES

This section is an overview of the significant natural and cultural resources and gives an assessment of the general condition of these resources. The framework for the natural resources section is based on the generic resource categories from *NPS-77, Natural Resources Management Guideline*.

NATURAL RESOURCES BASELINE INFORMATION

Vegetation resources have been inventoried to meet the Level 1 standard (minimum level) in the servicewide "Standards for Natural Resources Inventory and Monitoring."

Baseline information is available for air quality, water quality, and sound levels. Information on soils, minerals and rocks, wildlife, fish, amphibians, reptiles, birds, and insect species is inadequate.

NATURAL RESOURCES

Vegetation

The monument is physiographically located within the Colorado Plateau, primarily supporting desert-shrub vegetation. The plant communities are riparian (near the water), grassland, blackbrush, talus slope (sparsely vegetated shrubland growing on talus slopes), and hanging gardens (specialized wetland vegetation growing along seeplines). There is a wide diversity of plants in these communities, due to the numerous micro-habitats in the monument.

Tamarisk is an exotic plant species that has invaded the monument. It has a negative impact on seeps, springs, and the hanging gardens and could impair the aesthetic view of the bridge. Despite the tamarisk, the overall condition of monument vegetation is considered good.

Animal Species

Animal life is typical of a semidesert climate. Mule deer, coyote, and gray fox range widely throughout the area and use the monument. Jackrabbits, birds, rodents, and reptiles inhabit the monument. Two endangered species, the peregrine falcon and the bald eagle, use the monument. In 1989, a pair of peregrine falcons established an aerie near the arch during their nesting season and bald eagles use the monument area in the winter. The topographic diversity and abundance of prey within and around Lake Powell attract these endangered species.

Freshwater Aquatic Resources

Fish species are extensive throughout Lake Powell and in Bridge Canyon. Among the species in the monument are crappie, largemouth bass, carp, bluegill, and striped bass. Fishing is not allowed in the monument.

The water quality of the reservoir within the monument has been monitored on occasion and found to be good (bacterial monitoring only). Bridge Creek has not been checked for water quality. Surface films from boat fuel are sometimes present on Lake Powell around the docks at Rainbow Bridge.

Geologic Resources

The monument is an outstanding example of geologic processes and is of unquestioned national significance. As an outstanding example representing a major stage of earth's evolutionary history, Rainbow Bridge was nominated for status as a World Heritage Site.

Geologic processes on view at the monument are wind and water deposition, consolidation, periods of deformation by folding, warping, and faulting, normal erosion, and accelerated erosion brought about by general uplift. The result of these processes is a river system deeply entrenched in the sedimentary rocks of the Colorado Plateau.

Rainbow Bridge was monitored for stability by the U.S. Bureau of Reclamation (BOR) from 1974 through 1984, as part of the court settlement of a lawsuit contesting Bureau actions in allowing the reservoir waters of Lake Powell to enter the monument. The purpose of the monitoring was to detect any adverse effects to the stone arch, caused by rising lake waters in the canyon beneath the arch foundation. Measurement was to detect any movement or shifting of the bridge structure.

The 1985 BOR report summarizing the ten year study indicated that no movement was detected. Since the study, more modern equipment and techniques are available and BOR continues the monitoring program, in cooperation with the NPS, using improved techniques.

The purpose of continued monitoring is to obtain a continuous record of the exact position of the arch and to detect any shifting or movement caused by the reservoir or outside influences. Monitoring will also provide baseline data on the arch, to permit evaluation of natural weathering and other processes affecting the span.

Erosion is a natural process throughout the monument, and is accelerated by wave action, lake level fluctuations, and multiple trailing. Rockfalls from high cliffs due to natural erosion pose a threat to the safety of visitors.

Soil Resources

Fine, sandy soils from the Entrada and Navajo geologic formations are most prevalent throughout the area, with caliche and bentonite deposits occasionally found near the surface. The large number of visitors using the area immediately around Rainbow Bridge has created a network of paths or multiple trails causing erosion, soil compaction, loss of vegetative cover, and mass wasting in sandy areas.

In areas near the bridge and shoreline, where the trail is less defined, as much as a foot of the limited topsoil has been lost. Some places are worn down to the Kayenta formation bedrock, with no soil left.

Air Resources

Rainbow Bridge is established as a Class II Federal air quality area. The air quality of the area was monitored prior to the start-up of the Navajo Generating Station. The average visibility, described in 1974 as "excellent" (about 125 miles), is now noticeably less. NPS, in cooperation with other State and Federal Agencies and private industry, has developed an extensive ongoing monitoring plan for gaseous and particulate constituents of the atmosphere and for visibility. Research objectives include an in-depth analysis of the regional airshed and the identification of emission sources.

Aesthetic Resources

The preservation of the natural scene is a primary natural resource objective. The presence and continued expansion of tamarisk threatens to impair this natural scene. The growth of tamarisk along the trail from the floating walkway to the bridge obscures photo opportunities, forcing visitors to leave the path to get a clear photograph of the bridge. By leaving the path, visitors accelerate the soil compaction problem and damage the native vegetative cover.

Integrated Pest Management

As noted in the Vegetation and Aesthetic Resources sections, tamarisk is an exotic plant, which negatively impacts the natural scene and indirectly causes other resource damage.

Endangered, Threatened, and Rare Species

The peregrine falcon uses the park during nesting season and bald eagles use the park during the winter. A peregrine falcon aerie was found near the bridge during a monitoring exercise in the spring of 1989. The Navajo Mountain vole is known to occur nearby at 10,000 feet elevation. Although it is not known to inhabit the monument, a thorough inventory could prove its existence there. Monitoring for endangered, threatened, and rare species will continue.

Although there are no endangered, threatened, or rare plant species in the monument, *Primula specuicola*, (primrose family) grows in the monument. It is considered a 3(C) category by the U.S. Fish and Wildlife Service. (Category 3[C] is a category used for plants that have been determined to be too widespread, or lack sufficient threats to warrant further consideration under the Endangered Species Act.)

Hazardous Waste

The current heavy visitation is expected to continue, causing extensive crowding in the dock area as boats maneuver to the dock. Minor bumping accidents between boats occur routinely, with occasional incidents of extensive damage due to inexperienced boat operators. The potential for fuel spills from these incidents is high. At this time, there is no equipment or permanent staff at the monument to contain a fuel spill.

Public Health and Safety

The possibility of rockfalls, mentioned under Geologic Resources, is a threat to public safety throughout the monument. A rockfall originating above the visitor access trail several years ago did not injure anyone, only through good luck. The potential for property damage and serious injury or death exists.

Sound

The integrity of Rainbow Bridge may be affected by sound levels from the many visitors, boats, and aircraft around the monument. Because the bridge is in a narrow, steep-walled canyon, all sounds are amplified and echo throughout the area. Sound levels were monitored in the monument for a year, ending in May 1990, to establish a data base.

III. NATURAL RESOURCES MANAGEMENT PROGRAM

OVERVIEW OF CURRENT PROGRAM AND NEEDS

The stability of the Rainbow Bridge stone arch, the significant geologic feature of the monument and the monument's reason for being, is monitored annually by the Bureau of Reclamation. Early warning of any natural or man-caused threats to the integrity of the arch should be obtained through this monitoring.

Current activities emphasize protection through the presence of law enforcement and interpretive staffs and advisory notices. There is, however, insufficient staff to provide full protection and resource damage continues. Critical unmet needs include additional visitor services staff to upgrade resource protection and sufficient funding to rehabilitate damaged areas. A key aspect of the upgraded services program would be to improve interpretive services, to foster in visitors, a greater sense of value for the natural resources during the monument visit.

The other natural resources of the monument, including it's vegetation, animal life, and Bridge Creek, are threatened by multiple trailing, heavy use, and vandalism resulting from the high number of visitors. These resources are part of the monument setting and its aesthetic appeal, and they must be protected. Where damage has already occurred, plants, soils, and animal habitats should be restored.

Other needs include baseline resource inventory and monitoring of vegetation, soils, wildlife, and geologic hazards. The programming sheets on pages 8 through 11 and Tables 1 and 2 in the appendices provide summary information on the current program needs.

06/15/90

NATURAL
PROGRAMMING SHEET I
CURRENT YEAR FUNDED ACTIVITIES
($ in thousands)

Page: 1
FY: 90
PARK: RABR
REGION: RMR

PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICEWIDE ISSUE	FUNDING SOURCE	ACT TYPE	CURRENT YEAR $$	FTE	OUTYEAR 1 $$	FTE	OUTYEAR 2 $$	FTE	OUTYEAR 3 $$	FTE	TOTAL $$	FTE
008	MONITOR STABILITY OF RAINBOW BRIDGE			N20	NRNON NPS	MON	2.0		2.0		2.5		2.5		9.0	
				TOTAL FOR ALL ACTIVITIES			2.0		2.0		2.5		2.5		9.0	
019	PROTECT AND INTERPRET RESOURCES			N22	PKNR-OTH	MIT	2.5	0.1							2.5	0.1
					PKNR-OTH	INT	6.0	0.3							6.0	0.3
					PKNR-OTH	PRO	3.0	0.2							3.0	0.2
				TOTAL FOR ALL ACTIVITIES			11.5	0.6							11.5	0.6

PK PRI	PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICE WIDE ISSUES	FUNDING SOURCE	ACT TYPE	STARTING YEAR $$	FTE	OUTYEAR 1 $$	FTE	OUTYEAR 2 $$	FTE	OUTYEAR 3 $$	FTE	TOTAL $$	FTE
5	001	COMPILE BASELINE NATURAL RESOURCE INVENTORY			N20	REGN-NR	RES	12.0								12.0	
		TOTAL FOR ALL ACTIVITIES						12.0								12.0	
4	002	MONITOR AND PROTECT ENDANGERED SPECIES			N02 N03	REGN-NR	MON	2.0								2.0	
						PARK-NR	MON	5.0	0.2	2.0	0.1	2.5	0.1	2.5	0.1	12.0	0.5
						PKNR-OTH	PRO	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
						REGN-NR	RES					7.0				7.0	
		TOTAL FOR ALL ACTIVITIES						9.0	0.3	4.0	0.2	12.0	0.2	5.0	0.2	30.0	0.9
7	003	DEVELOP A VEGETATION MANAGEMENT PLAN			N08	REGN-NR	MON	6.0								6.0	
		TOTAL FOR ALL ACTIVITIES						6.0								6.0	
12	004	DEVELOP A GEOGRAPHIC INFORMATION SYSTEM (GIS)			N20	REGN-NR	RES	8.0		72.0						80.0	
						PARK-NR	MON			25.0	1.0	25.0	1.0	25.0	1.0	75.0	3.0
		TOTAL FOR ALL ACTIVITIES						8.0		97.0	1.0	25.0	1.0	25.0	1.0	155.0	3.0
11	005	CONTROL EXOTIC PLANTS			N05	PARK-NR	ADM	2.0	0.1							2.0	0.1
						PKNR-OTH	MIT	2.0	0.1					2.5	0.1	4.5	0.2
						PARK-NR	MIT	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
						PARK-NR	MON			2.0	0.1	2.5	0.1	2.5	0.1	7.0	0.3
		TOTAL FOR ALL ACTIVITIES						6.0	0.3	4.0	0.2	5.0	0.2	7.5	0.3	22.5	1.0
10	006	DEVELOP AN IPM PLAN			N04 N05	REGN-NR	MIT	3.0								3.0	
		TOTAL FOR ALL ACTIVITIES						3.0								3.0	
8	007	MONITOR RIPARIAN HABITAT			N05 N18	REGN-NR	MON	1.5								1.5	
						PARK-NR	MON	2.5	0.1	2.5	0.1	2.5	0.1	2.5	0.1	10.0	0.4

06/15/90

NATURAL
PROGRAMMING SHEET 2
UNFUNDED ACTIVITIES
($ in thousands)

PK PRI	PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICE WIDE ISSUES	FUNDING SOURCE	ACT TYPE	STARTING YEAR $$	FTE	OUTYEAR 1 $$	FTE	OUTYEAR 2 $$	FTE	OUTYEAR 3 $$	FTE	TOTAL $$	FTE
8	007	MONITOR RIPARIAN HABITAT			N05 N18			(CONT'D from previous page)									
		TOTAL FOR ALL ACTIVITIES						4.0	0.1	2.5	0.1	2.5	0.1	2.5	0.1	11.5	0.4
1	009	MONITOR EROSION AND HAZARDOUS ROCKFALL AREAS			N20	PARK-NR	MON	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
		TOTAL FOR ALL ACTIVITIES						2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
18	010	SECURE WATER RIGHTS FOR THE MONUMENT			N13	WATER RES	PRO	17.0								17.0	
						PARK-NR	MON	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
		TOTAL FOR ALL ACTIVITIES						19.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	26.0	0.4
3	011	ELIMINATE MULTIPLE TRAILS			N18	RGNR-OTH	MIT	35.0								35.0	
		TOTAL FOR ALL ACTIVITIES						35.0								35.0	
6	012	REHABILITATE AREAS OF SOIL COMPACTION			N22	PARK-NR	MIT	8.0	0.2	5.0		5.0	0.2			18.0	0.4
						RGNR-OTH	MIT			40.0						40.0	
						PARK-NR	MON							2.5	0.1	2.5	0.1
		TOTAL FOR ALL ACTIVITIES						8.0	0.2	45.0		5.0	0.2	2.5	0.1	60.5	0.5
13	013	DEVELOP A HAZARDOUS SPILL PROGRAM			N11	PARK-NR	MIT	5.0	0.1							5.0	0.1
						PKNR-OTH	PRO	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
		TOTAL FOR ALL ACTIVITIES						7.0	0.2	2.0	0.1	2.5	0.1	2.5	0.1	14.0	0.5
14	014	MONITOR WATER QUALITY			N20	PARK-NR	MON	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
		TOTAL FOR ALL ACTIVITIES						2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4

NATURAL
PROGRAMMING SHEET 2
UNFUNDED ACTIVITIES
($ in thousands)

PK PRI	PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICE WIDE ISSUES	FUNDING SOURCE	ACT TYPE	STARTING YEAR $$	FTE	OUTYEAR 1 $$	FTE	OUTYEAR 2 $$	FTE	OUTYEAR 3 $$	FTE	TOTAL $$	FTE
15	015	CONDUCT A SOUND MONITORING STUDY			N15	NWASO-OTH	MIT	22.0								22.0	
						PARK-NR	MON			2.0	0.1	2.5	0.1	2.5	0.1	7.0	0.3
		TOTAL FOR ALL ACTIVITIES						22.0		2.0	0.1	2.5	0.1	2.5	0.1	29.0	0.3
16	016	DEVELOP AN AIRCRAFT OVERFLIGHT PLAN			N15	NWASO-OTH	RES	15.0		10.0						25.0	
		TOTAL FOR ALL ACTIVITIES						15.0		10.0						25.0	
9	017	MONITOR NATIVE AND ALIEN VEGETATION		COMB	N08 N05	PARK-NR	MON	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
		TOTAL FOR ALL ACTIVITIES						2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
17	018	INVENTORY AND MONITOR AESTHETIC RESOURCES			N20	REGN-NR	RES	4.5	0.1							4.5	0.1
						PARK-NR	MON	2.0	0.1	2.0	0.1	2.5	0.1	2.5	0.1	9.0	0.4
		TOTAL FOR ALL ACTIVITIES						6.5	0.2	2.0	0.1	2.5	0.1	2.5	0.1	13.5	0.5

NATURAL RESOURCE PROJECT STATEMENTS

RABR-N-001	Compile Baseline Natural Resource Inventory
RABR-N-002	Monitor and Protect Endangered Species
RABR-N-003	Develop A Vegetation Management Plan
RABR-N-004	Develop A Geographic Information System (GIS)
RABR-N-005	Control Exotic Plants
RABR-N-006	Develop An Integrated Pest Management Plan (IPM)
RABR-N-007	Monitor Riparian Habitat
RABR-N-008	Monitor Stability of Rainbow Bridge
RABR-N-009	Monitor Erosion and Hazardous Rockfall Areas
RABR-N-010	Secure Water Rights for The Monument
RABR-N-011	Eliminate Multiple Trails
RABR-N-012	Rehabilitate Areas of Soil Compaction
RABR-N-013	Develop A Hazardous Spill Program
RABR-N-014	Monitor Water Quality
RABR-N-015	Conduct Sound Monitoring Study
RABR-N-016	Develop an Aircraft Overflight Plan
RABR-N-017	Monitoring of Native and Alien Vegetation
RABR-N-018	Inventory and Monitor Aesthetic Resources
RABR-N-019	Protect and Interpret Resources

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-001

TITLE: COMPILE BASELINE NATURAL
RESOURCE INVENTORY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N20

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Natural resource inventory baseline information needs to be compiled for Rainbow Bridge National Monument in order to arrive at sound management decisions. That information does not presently exist for the monument except for its vegetation and geology. Resource losses may be occurring due to high visitation, off-trail hiking, boat traffic, sound levels, and soil compaction.

DESCRIPTION OF ACTION:

1) Recommended Action:

ESTABLISH A BASELINE RESOURCE INVENTORY.

Prepare a thorough level I, baseline natural resource inventory of Rainbow Bridge. Inventories should include, but not be limited to, soils, mammals, birds, reptiles, amphibians,insects, minerals, and fish as well as water and vegetation.

As a result of a through inventory, an adequate source of information related to setting "limits of acceptable change" and carrying capacity, as well as characterizing existing conditions, would exist upon which management decisions could be based. This information will also be used in interpretive programs that will enhance visitor experiences.

This will be an on going project which would come under the responsibility of the Resource Management Division.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

Proposal Date: 90

PROJECT STATEMENT SHEET

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	RES	12.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-002

TITLE: MONITOR AND PROTECT
ENDANGERED SPECIES

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N02 N03

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

As a Federal Agency, the National Park Service is mandated to protect endangered species such as the bald eagle and peregrine falcon residing within Rainbow Bridge National Monument.
Peregrine falcons and bald eagles, two species of key interest to the conservation community, spend portions of their life cycles within the monument. Their endangered species status signifies the need to ensure their protection.

Other monitoring and protection concerns relate to habitat needs, adequate nesting and winter roost sites, availability of forage species, etc., and protection from hunting extend beyond monument boundaries.

Upon completion of an inventory, it may be found that other listed animals or plants exist in the monument.

DESCRIPTION OF ACTION:

1) Recommended Action:

PROTECT AND MONITOR SPECIAL STATUS SPECIES.

Park staff will regularly monitor the peregrine falcon and bald eagle populations in the monument by recording locations, activities and population numbers (annually May-July). Impacts from adjacent areas will be investigated and park strategies developed to mitigate impacts. Prey species will be determined. New eyries will be searched for in the monument.

A professional monitoring program will be developed and implemented by park staff. Research on special status species and their habitat requirements will be proposed as needed.

Proposal Date: 90

PROJECT STATEMENT SHEET

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	MON	2.0	
	NF1	MON	5.0	0.2
	NF2	PRO	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1
	NF2	PRO	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1
	NF2	PRO	2.5	0.1
	NF3	RES	7.0	

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1
	NF2	PRO	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-003

TITLE: DEVELOP A VEGETATION
MANAGEMENT PLAN

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N08

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Alien species, heavy visitation, destabilization of soils caused by multiple trailing and flash flooding, and possibly air pollution, are having noticeable impacts on the vegetative resources of Rainbow Bridge National Monument. A vegetation management plan is necessary to direct the management of these resources so continued degradation does not occur.

The micro-habitats found in the five plant communities in the monument provide for a diverse assemblage of species and plant associations. These communities are part of the aesthetic backdrop of the monument and are representative of regional biotic setting. Due to the lack of moisture, poor soils and temperature extremes, the area is generally devoid of trees except in riparian zones. There are large areas sparsely covered with blackbrush, Indian ricegrass, cacti, yucca, and other semidesert plants and grasses but generally, much of the area is bare rock, sandstone formations and drifting sand. On the higher plateaus and mesas, pinyon pine, juniper and other semi-evergreens are found. Small wetland communities exist at permanent seeps and alcoves.

Tamarisk is an alien plant species that has invaded the monument. Native plant species are suffering from heavy visitation, which is causing soil compaction and loss of vegetation. In other areas, sandy soils on steep slopes are destabilized by multiple trails endangering vegetation. Another concern caused by increasing visitation is that the natural character of the vegetation has been locally altered and is threatened by interruption or modification of natural processes. Air pollution -- regional and local sources (boat exhaust) -- could be affecting the native vegetation.

DESCRIPTION OF ACTION:

Proposal Date: 90

PROJECT STATEMENT SHEET

1) Recommended Action:

DEVELOP A VEGETATION MANAGEMENT PLAN

An existing inventory of plant species meets the Level 1 servicewide inventory standards. A Vegetation Management Plan would include:
1) the inventory and monitoring of native plant species; 2) the restoration of disturbed sites; 3) control of exotic species; 4) protection of possible candidates to the endangered and threatened plant list; 5) the policy for natural disturbances, such as fire.

The goals of the Vegetation Management Plan are to:

- Inventory, classify and map the vegetation of the monument to provide baseline information for management.

- Monitor vegetative communities and species to assess and evaluate ecosystem processes, detect trends and provide information for their preservation and protection.

- Study the distribution and abundance of plant species and their response to past and present disturbances to provide information for their preservation and protection.

- Identify alien plant species, determine their effects on native ecosystems and natural processes, and to provide for their control and removal where desirable and feasible.

- Study and evaluate the effects of disturbances and other impacts, such as air pollution, on vegetation and determine the management implications of these impacts.

- Develop a vegetational history of the monument.

- Restore plant communities to their natural character by revegetation of eroded and impacted sites where appropriate.

- Manage the vegetation populations and ecosystems to maintain the ecological diversity and health of native species populations.

Related projects include: RABR-N-002; RABR-N-005; RABR-N-007; RABR-N-009; RABR-N-011; RABR-N-012.

Proposal Date: 90

PROJECT STATEMENT SHEET

Project duration for the development of the plan will be one year. Components of the plan have been identified under separate project statements and their duration will vary.

Responsibility of the project will be assigned to the Branch of Natural Resources. Some consultation with Regional Resource Management personnel may be necessary.

Project will be carried out by park staff, with the assistance of the Regional Resource Management staff.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EA

EXPLANATION:

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	MON	6.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-004

TITLE: DEVELOP A GEOGRAPHIC
INFORMATION SYSTEM (GIS)

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N20

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

The park will be compiling large amounts of data related to the natural and cultural environment, as well as the management of monument operations that include resources management, interpretive, maintenance, visitor protection, and administrative functions. The ability to utilize these data as they apply to different programs both now and in the future is of concern.

The compilation of all data into one central organization unit, such as a Geographic Information System (GIS), will provide an efficient means for the long-term monitoring and assessment of future changes in resource conditions and for the overall planning of monument operations. The ability to have a graphic display and hard-copy output of an information base will greatly facilitate the sharing of information across divisions for more effective, well-coordinated management of Rainbow Bridge National Monument.

DESCRIPTION OF ACTION:

1) Recommended Action:

DEVELOPMENT OF A GEOGRAPHIC INFORMATION SYSTEM (GIS)

A GIS will be developed and include all new and existing data. To accomplish the task of creating a GIS which would be a decision-making tool for management, the park needs in place a central processing unit and screen-copy printer and plotter capable of facilitating the use of software packages such as GRASS, SAGIS and Arc-info for data input and manipulation. Types of data themes necessary and which need to be acquired would include, but are not limited to, soils, vegetation, wildlife populations, archeological sites, geology, hypsography, facilities, and trails.

Proposal Date: 90

PROJECT STATEMENT SHEET

The establishment of this GIS would ensure the proper monitoring of resources and coordination of all management programs, both now and in the future.

The project would be ongoing and new data would be acquired, "ground truthed" and added to the database as needed. The initial phase of the project would be over a two-year period and would include: acquisition of initial data themes (listed previously) for input into the system (year 1 and on an ongoing basis); acquisition of hardware and software to facilitate manipulation of data themes (year 2); establishment of a permanent, full-time position to manage the GIS (year 2).

The development and management of the GIS would be the responsibility of the Division of Resource Management.

Staffing for system management would be through the Branch of Natural Resources and require that the system operator be knowledgeable of natural resources management as well as having acquired the technical skills necessary to operate a GIS.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	RES	8.0	

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF3	RES	72.0	
	NF1	MON	25.0	1.0

Proposal Date: 90

PROJECT STATEMENT SHEET

Year 3:

Source	Act Type	Budget($1000)	FTE
NF1	MON	25.0	1.0

Year 4:

Source	Act Type	Budget($1000)	FTE
NF1	MON	25.0	1.0

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-005

TITLE: CONTROL EXOTIC PLANTS

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N05

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Alien species were first documented in the monument following the high water in Lake Powell during 1983. Since 1983,the spread has continued throughout the monument below and above the high-water line. Mitigation is necessary to protect native vegetation and control wide-spread exotic establishment.

Tamarisk (Tamarix ramosissima) is an alien plant species that invaded the monument when Lake Powell entered the monument, reached its maximum level at 3,708.6 feet elevation, and receded. Tamarisk is a phreatophyte which could threaten water seeps, springs and hanging gardens by monopolizing the water source and, in effect, dry up the seeps and springs. The riparian environment of Bridge Creek and the lakeshore in Bridge Canyon would be altered and negatively impacted if tamarisk remains unchecked.

Tamarisk is a major invader of the slope above the walkway, below seeps and along small tributary canyons crossed by the trail. Total infestation is less than one acre. In 1989, the age class of the tamarisk stands was six years or less. The plant is visually prominent; it affects the aesthetic appearance of the area and obstructs views along the trail, detracting from the natural aspect of the monument.

At low water levels it may invade, establish itself and create hazards to boats when water levels rise, inundating plants that have become well established.

Thickets can also affect trail maintenance and retard native species and also become a fire hazard.

Other alien species occur within the park, but are not considered to pose a significant threat to park resources at present.

Proposal Date: 90

PROJECT STATEMENT SHEET

DESCRIPTION OF ACTION:

1) Recommended Action:

PREPARE A TAMARISK CONTROL ACTION PLAN

This action will include a review of tamarisk control technology and preparation of an environmental assessment. Action could include total removal of tamarisk by mechanical means, followed by a continuing control program. Action could also include habitat restoration to competitively inhibit reestablishment of tamarisk. Tamarisk control would safeguard park resources, notably the view of the natural bridge, water availability at seeps and springs and the existence of some hanging gardens.

CONTROL TAMARISK IN ACCORDANCE WITH THE CONTROL ACTION PLAN

It is NPS policy to control exotic species when they threaten park resources. The effort to carry out control measures over the entire park would be manageable because of the small size of the monument (160 acres).

MONITOR TAMARISK REINVASION AND EFFECTIVENESS OF CONTROL

Specific sites within the monument where tamarisk occurs, or has the potential to occur, would be monitored on a routine basis. Monitoring will address control effectiveness, detection of new invasion, and any reinvasion of tamarisk.

MONITOR OTHER ALIEN SPECIES

Alien species other than tamarisk are not considered a significant threat at present. Russian thistle (Salsola kali) is known to be present. A survey will be conducted to identify any additional species and potential threats.

Other related projects/programs include: RABR-N-003;

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PROJECT STATEMENT SHEET

RABR-N-004; RABR-N-007; RABR-N-017 and the Integrated Pest Management program for the monument.

Duration of the initial phase of the project would be three years and would include: preparation of a tamarisk control action plan (year 1); control of tamarisk (year 2 and on an ongoing basis thereafter); monitor the effectiveness of control methods in accordance with vegetation monitoring protocol (year 3 and on an ongoing basis).

Responsibility for the project would be assigned to the Branch of Natural Resources and the Maintenance Division. Project components would be delegated as follows: direct control (chemical and mechanical) - Maintenance Division; habitat restoration, monitor tamarisk reinvasion and effectiveness of control, and monitor other exotic species - Branch of Natural Resources.

Park staff would be used to accomplish projects. Technical skills required to complete project would be approved training and certification of persons applying pesticides, knowledge of proper control techniques and knowledge of vegetation of the monument and proper monitoring procedures to document effectiveness of control.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EA OTHER

EXPLANATION: Herbicide Use Approval; WASO-IPM

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF1	ADM	2.0	0.1
	NF2	MIT	2.0	0.1
	NF1	MIT	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1
	NF1	MIT	2.0	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1
	NF1	MIT	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1
	NF2	MIT	2.5	0.1
	NF1	MIT	2.5	0.1

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-006

TITLE: DEVELOP AN IPM PLAN

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N04 N05

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Currently, alien species are not being controlled within the monument. The spread of alien species poses a threat to native vegatation of the monument, Glen Canyon National Recreation Area and the Navajo Nation. An Integrated Pest Management (IPM) approach to controlling the spread of alien species is mandated by National Park Service Policy Guidelines.

To date, the alien plant tamarisk is the only alien species identified as a pest requiring control. Management of this species will be carried out in accord with IPM principles. To date, the monument does not have an IPM plan to address the issue of monitoring and/or needed treatments for the long-term presertvation of the natural and cultural resources. Other pests which may need control in the future could include "weedy" invader species in disturbed sites and wood-rotting fungi attacking walkways.

DESCRIPTION OF ACTION:

1) Recommended Action:

DEVELOP AN IPM PLAN

An IPM plan would be developed and implemented for the monument as needed to control pests.

The basic plan outline would follow standard IPM protocol, and any recommended pesticide treatments would be cleared through standard IPM procedures.

Other related projects include: RABR-N-005

The initial phase of the project (development of an IPM plan) would be carried out over a one-year period, with implementation of the plan as necessary on an ongoing

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PROJECT STATEMENT SHEET

basis.

Project responsibility would be assigned to the Branch of Natural resources with assistance from the Regional IPM Coordinator.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EA

EXPLANATION:

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	MIT	3.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-007

TITLE: MONITOR RIPARIAN HABITAT

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N05 N18

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Riparian habitats represent important ecosystems from the standpoints of biological diversity and productivity. Monitoring of these habitats is necessary to provide baseline and trend information for science, resource management, interpretation, and the development of management alternatives to maintain riparian ecosystems and prevent degradation.

The base of Rainbow Bridge is Kayenta formation sandstone, a reddish brown to purplish consolidation of sands and mud laid down two hndred million years age. Above its base, the bridge is composed of Navajo sandstone. The Kayenta is bedded, very hard and almost impervious to water. The Navajo is highly permeable and is considered a significant aquifer. Where bedding planes bearing water are exposed, as along a cliff face, the moist surface provides the medium for the growth of plants. Water penetrating to the surface of the Kayenta flows along to the margin of the overlying formation and discharges into Bridge Creek Canyon, creating surface flow supportive of riparian vegetation.

The riparian flora of the monument contains many species endemic to specialized Southwest environments. The integrity of the flora associated with riparian habitats is dependent upon the water quality and quantity in seeps and along canyon walls. This integrity can be threatened by invasion of alien species, over-collecting of plants, trampling by visitors, and by natural causes such as rockfalls, drought or fire.

DESCRIPTION OF ACTION:

1) Recommended Action:

PROJECT STATEMENT SHEET

DEVELOP A MONITORING PROGRAM FOR RIPARIAN HABITAT

Monitoring procedures will be developed specifically for monitoring floristic components of the monument riaparian community. Water quality of the monument will also be monitored on a regular basis and integrated with riparian data. These data will be used in concert to detect any deterioration that could impare or degrade the quality of the riparian habitat. Alien species monitoring will be an integral part of this project, and control efforts will be initiated in accord with IPM protocol as necessary to mitigate any potential threat to the riparian habitat.

IMPLEMENT MONITORING OF RIPARIAN HABITAT

Once developed, monitoring procedures will be carried out on a routine basis. Monitoring will address degradation of the riparian habitat and the water quality of the monument which could potentially affect the condition of the riparian resource.

The park GIS would be used to facilitate the use of these data to ensure the best possible management of the monument riparian community.

Other related projects include: RABR -N-001; RABR-N-003; RABR-N-004; RABR-N-005; RABR-N-006; RABR-N-017.

Development of a monitoring procedure is the key component in maintaining the habitat and preventing possible resource degradation (year 1). Implementation of monitoring the riparian habitat (year 2 and on an ongoing basis)

Project responsibility would be assigned to the Branch of Natural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App.2, 1.6

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PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	MON	1.5	
	NF1	MON	2.5	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-008

TITLE: MONITOR STABILITY OF
RAINBOW BRIDGE

FUNDING STATUS: FUNDED

SERVICEWIDE ISSUE CODES: N20

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Rainbow Bridge needs to be monitored in order to obtain a continuous record of the exact position of the arch and to detect any shifting or movement caused by the reservoir or other outside influences.

The U.S. Bureau of Reclamation has been, since 1974, monitoring the affects on Rainbow Bridge caused by the Lake Powell waters in the canyon beneath its foundation, through measurement, to detect any movement or shifting of the Bridge structure. A 1985 report summarizing ten years of study indicated that no movement could be detected. Since then, using improved techniques and instrumentation along with existing surveying and strain gauge points, continuing efforts are being made to provide baseline data on the arch to permit evaluation of man-caused and natural influences affecting the span.

Man-caused influences include the effects of raising and lowering the reservoir level in the canyon beneath the arch, illegal climbing by visitors on the arch, aircraft overflights (including military aircraft), and the vibration from sonic booms.

Natural processes and influences which could be of impact are weathering, fluctuations of moisture and temperature in the span, vibrations caused by rockfalls or spalling from cliffs in Bridge Canyon, floods in Bridge Canyon, and earthquakes in the region.

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PROJECT STATEMENT SHEET

DESCRIPTION OF ACTION:

1) Recommended Action:

CONTINUATION OF MONITORING EFFORTS WITH THE BUREAU OF RECLAMATION.

The Bureau of Reclamation has installed three reflector prisms on the upstream face of the arch and five surveying points in Bridge Canyon upstream of the arch. Geologic inspections and photographic records are to continue annually, while surveys using the prisms and fixed points are conducted each February and August, taking two-to-three man crews approximately three days.

Through efficient monitoring techniques, minute shifts and movements in the rock structure of Rainbow Bridge will be detected and will also help in documenting long-term stability. A biannual record of the exact position and configuration of the Bridge will be obtained, documenting any subtle shifts to within six months of occurrence. Should a major change occur, more information will be available to help attribute a cause.

The Branch of Natural Resources will continue to work in concert with the Bureau of Reclamation on this project. This project has been funded by the Bureau of Reclamation on its own volition; There is no guarantee that the bureau will continue funding the project.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

Proposal Date: 90

PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF12	MON	2.0	

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF12	MON	2.0	

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF12	MON	2.5	

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF12	MON	2.5	

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-009

TITLE: MONITOR EROSION AND
HAZARDOUS ROCKFALL AREAS

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N20

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Due to erosion forces and hazardous rockfalls within the monument boundaries, continued inspection of potentially hazardous areas must be ongoing.

Erosion is a natural process throughout the monument. New erosion caused by the influences of man in the monument are wave action, pool fluctuations of Lake Powell and multiple trailing.

Rockfalls due to natural or lake causes pose a threat to the safety of visitors. A rockfall originating above the visitor access trail several years ago did not injure anyone only through good luck. The potential for serious injury or death and property damage exists.

DESCRIPTION OF ACTION:

1) Recommended Action:

CONTINUE ANNUAL INSPECTIONS OF POTENTIAL HAZARD AREAS.

The National Park Service will negotiate with the U.S. Bureau of Reclamation (USBR) to conduct an annual hazard rock inspection of the monument noting potential danger areas. These areas would be regularly monitored using appropriate techniques such as crack measuring devices. If the potential danger of an imminent rockfall exists, management options are to restrict visitors from the area, reroute the visitor access routes or remove the danger.

Multiple trailing which is also one of the erosion forces acting on the monument is adressed in project statement RABR-N-011.

2) Alternative Actions and Impacts: N/A

Proposal Date: 90

PROJECT STATEMENT SHEET

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-010

TITLE: SECURE WATER RIGHTS FOR THE MONUMENT

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N13

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Water rights for the monument need to be secured to maintain its natural and historical nature.

Bridge Creek flows underneath Rainbow Bridge and created the arch by cutting through the sandstone in a geological process begun approximately 60 million years ago. Bridge Creek flows into the monument from the Navajo tribal lands to the southeast. Even though Lake Powell has altered the natural flow regime of the creek, it is essential that the park secure Bridge Creek water rights to maintain the natural and historical nature of the monument.

Need to assess instream flow required to maintain natural nature of the monument before perfecting water rights.

DESCRIPTION OF ACTION:

1) Recommended Action:

QUANTIFY AND SECURE WATER RIGHTS.

Park staff will work with the Water Resources Division based in Fort Collins, Colorado, and with the Regional Solicitor's Office in Denver to develop a program to secure water rights for the monument. This will be a multi-year effort involving historical and legal research, instream flow studies and field monitoring of flows in Bridge Creek, springs and seeps.

The Branch of Natural Resources will coordinate this effort.

2) Alternative Actions and Impacts: N/A

Proposal Date: 90

PROJECT STATEMENT SHEET

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF8	PRO	17.0	
	NF1	MON	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-011

TITLE: ELIMINATE MULTIPLE TRAILS

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N18

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Multiple trailing has resulted in a loss of soil and vegetation in several areas adjacent to the only maintained trail in the monument. Resource degradation will continue unless action is taken to mitigate this problem.

The NPS maintains one trail from the boat dock and floating walkway, under the natural bridge, to the boundary of the monument. The large number of visitors using the area immediately adjacent to Rainbow Bridge has created a network of multiple or social trails, causing soil compaction, erosion, loss of vegetative cover, mass wasting in sandy areas, and aesthetic degredation. These trails disturb natural environments, disrupt natural processes and destabilize slopes which then become safety hazards due to the potential for rockslides.

DESCRIPTION OF ACTION:

1) Recommended Action:

DELINEATE A SINGLE MAINTAINED TRAIL THROUGH THE MONUMENT

The park will mitigate the effects of multiple trailing by delineating a single maintained trail. In conjunction with the maintained trail, interpretive signs/brochures will be developed explaining the fragile nature of the resource and the need to stay on the delineated trail. Presently a 150-foot section of trail has been hardened using aggregated concrete, colored to blend with the natural surface.

DEVELOP AND IMPLEMENT A REHABILITATION MONITORING PROGRAM

PROJECT STATEMENT SHEET

Other related projects include: RABR-N-003; RABR-N-004; RABR-N-012

Project duration will delineate a single maintained trail through the monument and construction. Project responsibility will be assigned to Maintenance and Professional Services Divisions for planning and construction of the trail.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): DOC

EXPLANATION: NEPA compliance through RABR GMP

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF4	MIT	35.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-012

TITLE: REHABILITATE AREAS OF
SOIL COMPACTION

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N22

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Soil compaction and loss of vegetation in the monument is a problem directly related to multiple trailing caused by visitor use.

Multiple trailing has caused extensive soil compaction and loss of vegetation. Much of the original topsoil has been lost through erosion and some areas have been worn down to the Kayenta formation bedrock with no soil remaining. In areas near the boat dock and arch, the trail is less defined and as much as one foot of the limited topsoil has been lost from trailing and trampling. Native vegetation has been lost and the disturbed surface now has the potential to provide a medium for invasion by alien species.

DESCRIPTION OF ACTION:

1) Recommended Action:

DEVELOP AND IMPLEMENT A REHABILITATION ACTION PLAN

Park staff will develop and implement a rehabilitation action plan for the monument. Actions considered in the plan will include:

1) replacing lost topsoil in areas worn to bedrock
2) revegetation with native plants
3) scarification and aeration of compacted soil to aid restoration efforts

Restoration efforts will eliminate multiple trailing and, along with interpretive efforts, help mitigate vegetative loss and soil compaction in areas selected for public exclusion.

DEVELOP AND IMPLEMENT A REHABILITATION MONITORING PROGRAM

RABR-N-012

PROJECT STATEMENT SHEET

A rehabilitation monitoring program will be developed to guide future mitigation efforts and provide a baseline of information pertaining to restoration of soil and vegetation resources in the monument.

Project duration will be over a three-year period and will include:
- development of a rehabilitation action plan (year 1)
- implement rehabilitation action plan and estblishing monitoring (year 2)
- project evaluation through follow-up monitoring and additional mitigation efforts as necessary (year 3 and on an ongoing basis).

Other projects related include: RABR-N-003; RABR-N-004; RABR-N-011

Project responsibility will be assigned to the Branch of Natural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EA

EXPLANATION:

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF1	MIT	8.0	0.2

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF4	MIT	40.0	
	NF1	MIT	5.0	

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MIT	5.0	0.2

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Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-013

TITLE: DEVELOP A HAZARDOUS SPILL PROGRAM

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N11

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

The current heavy visitation is expected to continue and even expand causing extensive crowding in the dock area as boats maneuver to the dock. Minor bumping accidents between boats occur routinely with occasional incidents of extensive damage due to inexperienced boat operators. The potential for fuel spills from these incidents is high. At this time, there is no equipment or permanent staff at the monument to contain a fuel spill. There are no other known sources of potential release of hazardous materials.

DESCRIPTION OF ACTION:

1) Recommended Action:

A plan detailing appropriate spill containment techniques, equipment required, level of trained staff required, and cost estimates will be developed to handle any fuel spills at Rainbow Bridge. The plan will be developed in conjunction with the concesssioner, ARA, Inc. Current technology will be examined to develop the best techniques for the monument dock area and Bridge Canyon.

The plan would be implementeed through the acquisition of containment and cleanup materials for storage onsite and training of park staff.

2) Alternative Actions and Impacts:

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION; NEPA compliance through RABR GMP

COMPLIANCE CODE(s): DOC

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EXPLANATION: NEPA compliance through RABR GMP.

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF1	MIT	5.0	0.1
	NF2	PRO	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF2	PRO	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF2	PRO	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF2	PRO	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-014

TITLE: MONITOR WATER QUALITY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N20

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Water quality needs continued monitoring in order to provide baseline data for accurate management decisions.

Due to possible impacts from fuel spills at the boat docks and the floating vault toilets making swimming prohibited at the monument, water quality will be regularly monitored. Monitoring and testing is to be done at Glen Canyon NRA water laboratory on an intermittent basis with no evidence of degradation noted at this time. Additional monitoring of Bridge Creek will be done to establish a baseline and detect any changes.

DESCRIPTION OF ACTION:

1) Recommended Action:

CONTINUATION OF WATER QUALITY MONITORING.

Water quality will continue to be monitored. Monitoring provides baseline data to establish an early warning system. A constant monitoring program will help identify problem areas and causes, enabling NPS to prevent the degradation of the resource.

Monitoring will be coordinated and results determined by the Division of Natural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

Proposal Date: 90

PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-015

TITLE: CONDUCT A SOUND
MONITORING STUDY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N15

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Rainbow Bridge is located in a narrow, steeped-walled canyon. Sound from visitors, low-flying aircraft and boats is amplified and echoed throughout the canyon. Current monitoring indicates that visitor activity results in the greatest auditory impact to the area. This source is present most often near the bridge itself, with sound at various levels persisting throughout the day. Monitoring is being conducted under a one-year research program designed to assess the character and magnitude of noise impacts.

Rainbow Bridge and Navajo Mountain are the focus of many scenic flights in the area. Over 6,000 visitors per year presently take these flights. No figures are presently available on the number of private aircraft that fly over Lake Powell and Raindbow Bridge to view the scenery provided by these areas but both helicopter and fixed-wing aircraft fly above Bridge Canyon to sightsee around Rainbow Bridge. Sound caused by aircraft and their presence, detracts from the tranquility of the scene and has the potential to lessen the quality of the visitor's experience. Sound from military aircraft that traverse the area are less frequent, but could raise the background noise levels at the Bridge. Sonic booms may have particularly adverse social and physical impact (vibration).

Boat sounds are loud and usually present during daytime hours, making boats a significant source of potential sound impacts.

Besides detracting from the visitor experience, sound vibrations could potentially trigger rock slides within the confines of the narrow canyon.

DESCRIPTION OF ACTION:

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1) Recommended Action:

COMPLETE SOUND MONITORING STUDY

The ongoing sound monitoring will be completed in May 1990, and all data collected will be evaluated to determine if monitoring should continue and/or a specific mamgement action is warranted. Based on the the recommendations from this monitoring program, a Noise Abatement Plan may be developed to address methods of reducing visitor noise levels, recommended aircraft altitude levels, public education programs developed with Page Airport, and coordination with U.S. military flights to ensure appropriate flight routes and altitude levels. Sound monitoring in future years is likely to be needed.

During the current planning for Rainbow Bridge, the type, location and design of facilities will be evaluated for noise abatement value.

Related projects include: RABR-N-008; RABR-N-016

Project duration is one year, with follw-up monitoring on an ongoing basis, as necessary.

Project responsibility is assigned to WASO Mining and Minerals Division and the Branch of Natural Resources GLCA/RABR.

CONDUCT A STUDY OF VISITOR PERCEPTION OF SOUND LEVELS

Sound of various types and levels may or may not have a detrimental effect on visitors, depending on the perceptions and expectations. A study of the impact of sound on monument visitors is needed to assess the effect of recorded sound levels.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

Proposal Date: 90

PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF11	MIT	22.0	

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-016

TITLE: DEVELOP AN AIRCRAFT
OVERFLIGHT PLAN

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N15

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Private, commercial and military aircraft all share the same air space over Rainbow Bridge National Monument. Unscheduled and unregulated flights have the potential to impact passenger safety. Potentials for impacts need documentation and a management plan developed to address the issue.

Presently, both helicopter and fixed-wing aircraft fly into Bridge Canyon to sightsee around Rainbow Bridge. Unscheduled military flights also utilize the same air space during the same time as other private and commercial aircraft. All flights are unregulated as far as type and number of aircraft allowed in the area at one time.
Over 6,000 visitors on commercial flights, and an unknown number in private planes, visit the monument by air. Military flights are less frequent, but when added to the total number of flights in and around the area, the potential for in-flight accidents is very much a reality.

DESCRIPTION OF ACTION:

1) Recommended Action:

DEVELOP AN AIRCRAFT OVERFLIGHT PLAN

Commercial and private aircraft flights are increasing over the monument. The number of high-speed, military aircraft flights is presently unknown; however, the potential for in-flight collisions will not decrease even if the unknown status-quo for military flights is maintained.

A carrying capacity study for aircraft overflights needs to be initiated in a levels of accaptable change

RABR-N-016

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(LAC) framework to address the issues of airspace crowding, degradation of the natural and aesthetic resources of the monument and the issue of safety. This study would serve as the critical component in the development of an overall aircraft management plan.

Related projects include: RABR-N-015

The project would be carried out over a two-year period and will include: carrying capacity study for aircraft overflights (year 1); development of an aircraft management plan for the monument (year 2).

Project responsibility would be assigned to the Branch of Natural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EA

EXPLANATION:

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF11	RES	15.0	

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF11	RES	10.0	

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-017

TITLE: MONITOR NATIVE AND
ALIEN VEGETATION

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N08 N05

CULTURAL RESOURCE TYPE CODE (where applicable): COMB

PACKAGE NUMBER:

PROBLEM STATEMENT:

Impacts to the native vegetation of Rainbow Bridge National Monument are presently occurring from heavy visitation and the invasion of alien flora. Air pollution, too, has the potential to impact the native flora of the monument. In order to monitor change in species composition, vitality and overall cover, a monitoring program will be implemented to address these issues.

The park GIS will be used to store and manipulate data collected in the field so that the most effective use and integration of these data can be made to facilitate sound management decisions.

DESCRIPTION OF ACTION:

1) Recommended Action:

IMPLEMENT VEGETATION MONITORING

Upon establishment of the monitoring program, field data can be collected based on the established monitoring protocol. These data can be stored in a database program and transferred directly to the GIS. Once integrated into the GIS, these data can be used in combination with other resource data layers, such as soils, to provide the most efficient use of all resource data for management purposes.

Related projects include: RABR-N-001; RABR-N-003; RABR-N-004; RABR-N-005; RABR-N-007;

Project duration is continuing and includes implementation of monitoring program and integration of database into the park GIS.

Responsibility of the project will be assigned to the

PROJECT STATEMENT SHEET

Branch of Natural Resources with assistance from the WASO GIS Division.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-018

TITLE: INVENTORY AND MONITOR
AESTHETIC RESOURCES

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: N20

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Aesthetic qualities of natural areas are often overlooked during the planning process. However, visitors to natural areas often derive the most satisfatction from their visit based on what they perceive as the aesthetic qualities a given resource provides.

It is documented that aesthetic qualities are one of the most significant resources of the monument, as visual beauty is most often cited by visitors as a primary reason for their visit. Results of a 1988 survey of monument visitors showed that 94 percent listed viewing scenery as a main activity and 80 percent listed photograpy.

Only through adequate inventorying and monitoring procedures can managment detect and mitigate damage to the natural and cultural resources of the monument to ensure that the aesthetic qualities are left unimpaired for future generations.

DESCRIPTION OF ACTION:

1) Recommended Action:

DOCUMENT EXISTING VIEWS

Establish photopoints to serve as baseline references.

INCORPORATE PROTECTION OF AESTHETIC RESOURCE INTO ONGOING MANAGEMENT

Establish aesthetics as primary objective.

2) Alternative Actions and Impacts: N/A

Proposal Date: 90

PROJECT STATEMENT SHEET

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App.2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF3	RES	4.5	0.1
	NF1	MON	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.0	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	NF1	MON	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-N-019

TITLE: PROTECT AND INTERPRET
RESOURCES

FUNDING STATUS: FUNDED

SERVICEWIDE ISSUE CODES: N22

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

Over 250,000 visitors go to the monument annually. Boat access and docking and pedestrian activities in the monument are restricted to the narrow canyon floor. The presence of uniformed personnel is necessary to inform visitors of proper behavior and to take direct action to stop prohibited activity that impacts visitor experience or resources. Litter pick up and graffiti prevention are ongoing required activities. Present staffing is inadequate to ensure resource protection but does occur particularly during the months of June through August.

DESCRIPTION OF ACTION:

1) Recommended Action:

Litter pickup and graffiti removal will take place. Patrols by uniformed staff will result in information to visitors on purpose of the monument and proper activities. Prohibited acts that result in degradation of resources will be stopped. Present staffing level is such that all prohibited acts are not stopped.

These activities are ongoing with most coverage occurring during the period of June through August and are the responsibility of the Visitor Services and Maintenance Divisions.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 526 DM2 app.2, 1.5 and 1.11

Proposal Date: 90

PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	NF2	MIT	2.5	0.1
	NF2	INT	6.0	0.3
	NF2	PRO	3.0	0.2

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

IV. PRESENT STATUS OF CULTURAL RESOURCES

CULTURAL RESOURCES BASELINE INFORMATION

The status of cultural resource documentation is indicated on the Cultural Resource Documentation Checklist located in the appendices.

CULTURAL RESOURCES

Sites

Definition: Sites are distinguishable pieces of ground; or areas upon which occurred some historic or prehistoric event; or which are significantly associated with historic or prehistoric events, persons, or cultures; or which were subjected to sustained human activity.

The Archeological Survey is about 63 percent complete. The higher 60 acres of the monument need to be surveyed. In 1985, archeologists from Northern Arizona University (Gieb...) intensively surveyed 100 acres of the monument. As a result of this survey, 8 archeological sites and 3 isolated finds were recorded in a 70-acre area of the monument. Of the eight sites recorded, six of the sites are deemed eligible for inclusion on the National Register of Historic Places, in accordance with the criteria in 36 CFR 60.4.

Four of the monument sites have potentially significant rock art inscriptions, including the names of such famous figures as Zane Grey and John Wetherill. One of the sites, UT-V-13-156, is located at the east base of the bridge, where numerous inscriptions have been carved throughout the years by park visitors. Detailed recording of these inscriptions may reveal the presence of additional significant inscriptions that have not yet been recognized. Two of four sites are located in the area of potentially heavy visitor graffiti (UT-V-13-156, and UT-V-13-152).

Structures

Definition: Structures are works of humans, consciously constructed to serve some form of human activity. The structures are usually immovable by nature or design.

There are no structures in the monument. Physical remains of early historic use along the Colorado River have all been inundated by Lake Powell. Physical remains of the Rainbow Lodge, and other structures along the Rainbow Trail are outside of the monument. However, numerous early registers from the lodge are currently in possession of the park. Plaques dedicated to the "discovery" party have been placed along the trail within the monument boundary.

Objects (Museum Collections)

Definition: Objects are material things possessing functional, aesthetic, cultural, symbolic, and/or scientific value. An object is usually movable by nature or design.

Glen Canyon NRA has a small collection of historic photographs and documents pertaining to the history of Rainbow Bridge and its visitors. The Rainbow Bridge photographic collection needs to be organized and cataloged and segregated from the Glen Canyon collection. The majority of the documents have already been cataloged and approximately 20 historic documents pertaining to Rainbow Bridge are currently stored as museum objects.

The photographic collection is currently located at the Wahweap district ranger's office and is generally in fair condition. None of the collection is stored in compliance with Special Directive 80-1, and it is expected that substantial deterioration of the photographs will be revealed when they are finally examined and their storage is upgraded. It is known that some nitrate negatives are either part of, or stored with, the Rainbow Bridge photographs. The historic documents range in condition from poor to good.

A Scope of Collections also should to be prepared to identify possible additions to the Rainbow Bridge museum collection. It is probable that the need for acquisition of historic and ethnographic documents, files, and historic photographs will be identified.

Ethnographic Resources

Definition: Ethnographic resources, in this context, are park resources that have traditional subsistence, sacred ceremonial or religious, residential, or other cultural meaning for members of contemporary park-associated ethnic groups, including Native Americans.

It is well known that Rainbow Bridge has religious significance for the Navajo people. There appears to be adequate evidence to conclude that twentieth-century Navajos and some San Juan Paiutes, influenced by the Navajos, consider Rainbow Bridge to be a sacred place. There is some evidence that veneration of Rainbow Bridge is an elaboration of a traditional Navajo attitude toward all natural arches and bridges.

The monument is occasionally used by individuals from the Navajo Tribe for religious ceremonies near the bridge. Currently, there is a great deal of visitor impact in the immediate area of the bridge itself. Visitation is high and unsupervised, resulting in a somewhat secular atmosphere.

There has been discussion between the Service and the Navajos that the monument be closed to the general public one day during the year to allow for Native American religious ceremonies. At this time, a formal request has not been made. These requests are normally granted as being in accord with the provisions of the Native American Religious Freedom Act.

V. CULTURAL RESOURCES MANAGEMENT PROGRAM

OVERVIEW OF CURRENT PROGRAM AND NEEDS

Sites

Graffiti is present in numerous locations along the visitor access trail. Identified archeological sites are in danger of being lost due to graffiti scratched upon the monument and patinated rock surfaces. There is currently no ongoing program for graffiti removal at Rainbow Bridge. The strategy for the future is for graffiti removal and cyclic maintenance. Currently, visitors are encouraged, through a law enforcement notice at the dock, to report all violations and destruction of monument resources. In light of the heavy visitation and destruction of park resources, park management is considering the establishment of a full-time ranger staff at the monument.

Most of the monument has been surveyed for archeological sites by archeologists from Northern Arizona University in 1985. They surveyed 100 acres of the 160 acres in the monument. The unsurveyed acres are primarily high in rocky areas requiring technical climbing expertise for access. The strategy for the future is to monitor and protect the eight recorded sites and to complete the survey.

Little information is available concerning historic values and administrative background for the park. The strategy for the future is to prepare a special historic study and Administrative History of the monument.

A study will also be prepared documenting the historic vernacular landscape and identifying condition changes. This will be used to guide future management actions in the monument.

Structures

There are no structures in the monument and physical remains of early historic use along the Colorado River have all been inundated by Lake Powell.

Objects (Museum Collections)

There is no ongoing program for the organization or cataloging of the photographic collection. The strategy for the future is for a Scope of Collections Statements to be developed and for the Rainbow Bridge photographic and archival collections to be cataloged and separated from the Glen Canyon collection.

Ethnographic Resources

It is well known that Rainbow Bridge has religious significance for the Navajo people, but there is no information defining the nature and extent of the bridge's significance. Currently the heavy, unsupervised visitation results in a somewhat secular atmosphere.

The strategy for the future is to prepare an ethnographic overview and assessment of the monument, which will identify information and resource data gaps and consultation needs as well as objectives and parameters for Ethnographic Resource Study, Traditional Use Study and Ethnographic Resource Inventory.

The programming sheets on pages 63 through 65 and Tables 1 and 2 in the appendices provide summary information on the current program needs. The cultural resource documentation checklist and status summary charts in the appendices provide additional overview.

06/15/90

CULTURAL
PROGRAMMING SHEET I
CURRENT YEAR FUNDED ACTIVITIES
($ in thousands)

Page: 1
FY: 90
PARK: KABR
REGION: RMR

PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICEWIDE ISSUE	FUNDING SOURCE	ACT TYPE	CURRENT YEAR		OUTYEAR 1		OUTYEAR 2		OUTYEAR 3		TOTAL	
							$$	FTE	$$	FTE	$$	FTE	$$	FTE	$$	FTE

06/15/90

CULTURAL
PROGRAMMING SHEET 2
UNFUNDED ACTIVITIES
($ in thousands)

Page: 1
FY: 90
PARK: RABR
REGION: RMR

PK PRI	PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICE WIDE ISSUES	FUNDING SOURCE	ACT TYPE	STARTING YEAR $$	FTE	OUTYEAR 1 $$	FTE	OUTYEAR 2 $$	FTE	OUTYEAR 3 $$	FTE	TOTAL $$	FTE
2	001	REMOVE GRAFFITI; CYCLIC MAINTENANCE		CULL	C18 C20												
						PARK-CR	MIT	5.0	0.4							5.0	0.4
						PKCR-OTH	MIT	2.0	0.1							2.0	0.1
						PKCR-OTH	PRO	12.0	0.5	12.0	0.5	15.0	0.5	15.0	0.5	54.0	2.0
						PARK-CR	MON			4.0	0.2	5.0	0.2	5.0	0.1	14.0	0.5
		TOTAL FOR ALL ACTIVITIES						19.0	1.0	16.0	0.7	20.0	0.7	20.0	0.6	75.0	3.0
6	002	PREPARE A SPECIAL HISTORY STUDY		ETHN	C01 C02	CRPP	RES	15.0		15.0						30.0	
		TOTAL FOR ALL ACTIVITIES						15.0		15.0						30.0	
4	003	PREPARE ETHNOGRAPHIC STUDIES		ETHN	C04	CRPP	RES	15.0		15.0						30.0	
		TOTAL FOR ALL ACTIVITIES						15.0		15.0						30.0	
8	004	CATALOG HISTORIC DOCUMENTS & PHOTOGRAPHS		OBJC	C03 C09												
						CYCLIC-CR	PRO	10.0								10.0	
						PARK-CR	PRO	2.0	0.1	2.5	0.1	2.5	0.1	2.5	0.1	9.5	0.4
		TOTAL FOR ALL ACTIVITIES						12.0	0.1	2.5	0.1	2.5	0.1	2.5	0.1	19.5	0.4
9	005	PREPARE A SCOPE OF COLLECTIONS STATEMENT		OBJC	C09	CRPP	ADM	7.5								7.5	
		TOTAL FOR ALL ACTIVITIES						7.5								7.5	
10	006	PREPARE AN ADMINISTRATIVE HISTORY			C08	CRPP	RES	15.0								15.0	
		TOTAL FOR ALL ACTIVITIES						15.0								15.0	
1	007	CONDUCT ROCK ART-HISTORIC INSCRIPTION INVENTORY		SITE	C02	CRPP	RES	10.0								10.0	
		TOTAL FOR ALL ACTIVITIES						10.0								10.0	
3	008	PREPARE ETHNOGRAPHIC OVERVIEW & ASSESSMENT		ETHN	C04	CRPP	RES	15.0								15.0	

CULTURAL
PROGRAMMING SHEET 2
UNFUNDED ACTIVITIES
($ in thousands)

PK PRI	PROJ STMT NUM	PROJECT OR ACTIVITY TITLE	PKG NUM	CULT RES TYPE	SERVICE WIDE ISSUES	FUNDING SOURCE	ACT TYPE	STARTING YEAR $$	FTE	OUTYEAR 1 $$	FTE	OUTYEAR 2 $$	FTE	OUTYEAR 3 $$	FTE	TOTAL $$	FTE
3	008	PREPARE ETHNOGRAPHIC		ETHN	C04			(CONT'D from previous page)									
			TOTAL FOR ALL ACTIVITIES					15.0								15.0	
5	009	PRESERVE CULTURAL LANDSCAPE		CULL	C11 N08	CRPP	RES	10.0								10.0	
			TOTAL FOR ALL ACTIVITIES					10.0								10.0	
7	010	MONITOR CULTURAL RESOURCES		SITE	C19	CYCLIC-CR	MON	10.0	0.4							10.0	0.4
						PARK-CR	MON			4.0	0.2	5.0	0.2	5.0	0.2	14.0	0.6
			TOTAL FOR ALL ACTIVITIES					10.0	0.4	4.0	0.2	5.0	0.2	5.0	0.2	24.0	1.0
11	011	CONDUCT ARCHEOLOGICAL INVENTORY		SITE	C02	CRPP	RES	10.0								10.0	
			TOTAL FOR ALL ACTIVITIES					10.0								10.0	

CULTURAL RESOURCE PROJECT STATEMENTS

RABR-C-001	Remove Graffiti; Cyclic Maintenance
RABR-C-002	Prepare A Special History Study
RABR-C-003	Prepare Ethnographic Studies
RABR-C-004	Catalog Historic Documents and Photographs
RABR-C-005	Prepare A Scope of Collections Statement
RABR-C-006	Prepare An Administrative History
RABR-C-007	Conduct Rock Art-Historic Inscription Inventory
RABR-C-008	Prepare Ethnographic Overview and Assessment
RABR-C-009	Preserve Cultural Landscape
RABR-C-010	Monitor Cultural Resources
RABR-C-011	Conduct Archeological Inventory

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-001

TITLE: REMOVE GRAFFITI; CYCLIC MAINTENANCE

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C18 C20

CULTURAL RESOURCE TYPE CODE (where applicable): CULL

PACKAGE NUMBER:

PROBLEM STATEMENT:

Heavy and unsupervised visitor use is resulting in extensive graffiti and defacement of exposed rock surfaces. This graffiti interferes with the visual impact of the bridge and detracts from the visitor's experience.

Graffiti is present in numerous locations along the visitor access trail, in many places scarring heavily patinated rock surfaces. Graffiti removal is difficult to do in such a way as to not extensively deface natural rock surfaces. Visitor graffiti is intermingled in several instances with historic inscriptions that have cultural and ethnographic significance. A program is needed to provide for the careful removal of graffiti using selected techniques to avoid damage to the rock surfaces, and to avoid impacting culturally significant inscriptions.

There is currently no ongoing program for graffiti removal at Rainbow Bridge. However, in 1988, a stabilization specialist conducted a training session in the proper methods for graffiti removal, and equipment and trained staff are available in-house. Documentation and monitoring methodologies currently being used for sites in Glen Canyon NRA could also be implemented at Rainbow Bridge.

Lack of uniformed rangers results in establishment of graffiti. Scheduled presence of uniformed personnel is needed to prevent graffiti as well as a passive information/education program to prevent visitors from causing graffiti.

DESCRIPTION OF ACTION:

1) Recommended Action:

Proposal Date: 90

PROJECT STATEMENT SHEET

DEVELOP AND IMPLEMENT A GRAFFITI REMOVAL AND PREVENTION ACTION PLAN

Park staff will develop and implement a graffiti removal and prevention action for the monument. The basic steps of the proposed activity include the following:

1. Graffiti Removal - using accepted techniques of wet and dry brushing, percussion and abrasion, and other methods, identified graffiti elements will be removed.

2. Photodocumentation - will be completed before and after graffiti removal, with notes taken on the extent and level of effort expended.

3. Develop information/education program and develop a schedule of on-site uniformed personnel.

Initial graffiti removal will restore the monument to a more pristine condition, thereby enhancing the visitor's appreciation and enjoyment.

Graffiti removal will occur during FY1.

DEVELOP AND IMPLEMENT A GRAFFITI MONITORING PROGRAM

A regular monitoring program, together with cyclic maintenance to remove new graffiti elements, will be instituted subsequent to graffiti removal. All staff assigned to this activity will be trained to utilize the baseline documentation to recognize and avoid historic elements.

Follow-up monitoring and cyclic maintenance on an on-going regular basis will prevent further unsightly graffiti accumulations before they become severe again.

Initial monitoring will take place during FY 1, within several months following graffiti removal; follow-up monitoring & cyclic maintenance will occur during FYs 2-4.

Other related projects include: RABR C 007

Project responsibility will be assigned to the Branch of Cultural Resources, Maintenance Division and Visitor Services Division

Proposal Date: 90

PROJECT STATEMENT SHEET

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): DOC NHPA

EXPLANATION: NEPA compliance addressed in GMP

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF1	MIT	5.0	0.4
	CF2	MIT	2.0	0.1
	CF2	PRO	12.0	0.5

Year 2:	Source	Act Type	Budget($1000)	FTE
	CF1	MON	4.0	0.2
	CF2	PRO	12.0	0.5

Year 3:	Source	Act Type	Budget($1000)	FTE
	CF1	MON	5.0	0.2
	CF2	PRO	15.0	0.5

Year 4:	Source	Act Type	Budget($1000)	FTE
	CF1	MON	5.0	0.1
	CF2	PRO	15.0	0.5

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-002

TITLE: PREPARE A SPECIAL HISTORY
STUDY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C01 C02

CULTURAL RESOURCE TYPE CODE (where applicable): ETHN

PACKAGE NUMBER:

PROBLEM STATEMENT:

Currently, little is known concerning significant aspects of the history of Rainbow Bridge. Such information would be useful in making certain management decisions. In addition, the history of exploration in and around the monument is known to be of particular interest to visitors to the monument. Potential topics include:

1. Historic use of the Colorado River in the vicinity of the monument during the late 1800s by Native American groups, miners and river-runners, specifically to address the question of who really "discovered" the bridge.

2. The construction and use of the Rainbow Lodge and Rainbow Trail, associated constructed roads leading to the Lodge, and specific sites and features along the trail.

3. The "discovery" party itself, its members, goals, and significance.

4. Visitation of the bridge since its "discovery."

5. Historic circumstances leading to its designation as a National Monument.

DESCRIPTION OF ACTION:

1) Recommended Action:

This project will be divided into three primary phases:

1. Conduct research to locate sources of information and develop plans for obtaining needed data.

2. Collect data, which may involve visiting archival

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PROJECT STATEMENT SHEET

repositories, contacting authorities on local history, researching source materials, conducting interviews, and reviewing park documents and files.

3. Prepare a synthetic report suitable for use as both an administrative document and interpretive resource. Any objects added to park collections as a result of the project will be cataloged and curated.

The completion of this project will contribute to more comprehensive understanding of historic use of the monument. This information will be useful for both management and interpretive needs.

The duration of the project will be two years. FY1 will include the identification of data sources and data collection. Report preparation will be completed in FY2.

Other related projects include: RABR C 006

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	15.0	

Year 2:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	15.0	

Year 3:	Source	Act Type	Budget($1000)	FTE

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PROJECT STATEMENT SHEET

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-003

TITLE: PREPARE ETHNOGRAPHIC
STUDIES

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C04

CULTURAL RESOURCE TYPE CODE (where applicable): ETHN

PACKAGE NUMBER:

PROBLEM STATEMENT:

Rainbow Bridge has religious significance for the Navajo people. It may be significant to other Native American peoples as well. An holistic ethnograhic study is needed to determine concerns for natural and cultural resources.

1. The nature and extent of the ethnographic significance of the bridge.

2. The role of the bridge in Native American cultures, in both modern and historic times.

3. The current needs and beliefs of Native American peoples relative to the monument that might affect management activities and concerns regarding the management of monument resources.

4. Modern patterns of access and use by contemporary Indian people.

This project can be divided into two phases: ethnographic fieldwork and report preparation.

DESCRIPTION OF ACTION:

1) Recommended Action:

An ethnographic study will be conducted to address the above concerns. The fieldwork phase will involve a background documentation (Ethnographic Overview and Assessment) review, followed by in-field interviews with Native Americans known to have occupied or used the Rainbow Bridge area for ceremonial or secular purposes. Interviews should include tribal elders who visited Rainbow Bridge in the past, when possible, as well as modern Native American visitors. The ensuing report will be suitable for both administrative and

Proposal Date: 90

interpretive use, and might complement the Historic Use Study (RABR-C-002).

The project will take two years to complete. FY1 will involve fieldwork and data collection. Report preparation will be completed during FY2. All objects obtained as a part of the project will be cataloged and curated.

Other related projects include: RABR C 008
RABR C 009

Project responsibility will be assigned to the Branch of Cultural Resources, who will be responsible for coordinating various aspects of the project, overseeing the fieldwork, and reviewing report drafts.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL OTHER

EXPLANATION: 516 DM2 App. 2, 1.6. AIRFA consulta

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	15.0	

Year 2:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	15.0	

Year 3:	Source	Act Type	Budget($1000)	FTE

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PROJECT STATEMENT SHEET

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-004

TITLE: CATALOG HISTORIC
DOCUMENTS & PHOTOGRAPHS

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C03 C09

CULTURAL RESOURCE TYPE CODE (where applicable): OBJC

PACKAGE NUMBER:

PROBLEM STATEMENT:

Glen Canyon NRA currently has a small collection of historic photographs and documents pertaining to the history of Rainbow Bridge and its early visitors. There is currently no ongoing program for the care of these collections, or for the organization or cataloging of the photographic collection.

The Rainbow Bridge photographic collection needs to be organized, cataloged, and segregated from the Glen Canyon collection and stored in a manner that prevents/retards deterioration of any collections. Most of the documents have already been cataloged but also need to be segregated from the Glen Canyon collection. An unknown number of photographs with nitrate negatives need to be copied.

DESCRIPTION OF ACTION:

1) Recommended Action:

Treatment of the photographic collection will involve the organization, identification, copying, labeling, cataloging, and storage of each item. It may be necessary to issue new catalog numbers to each photograph or document to be segregated for the Rainbow Bridge collection.

This project will be completed within one year.

Other related projects include: RABR C 005

Project responsibility will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

Proposal Date: 90

PROJECT STATEMENT SHEET

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 7.4 E(2)

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF7	PRO	10.0	
	CF1	PRO	2.0	0.1

Year 2:	Source	Act Type	Budget($1000)	FTE
	CF1	PRO	2.5	0.1

Year 3:	Source	Act Type	Budget($1000)	FTE
	CF1	PRO	2.5	0.1

Year 4:	Source	Act Type	Budget($1000)	FTE
	CF1	PRO	2.5	0.1

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-005

TITLE: PREPARE A SCOPE OF COLLECTIONS STATEMENT

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C09

CULTURAL RESOURCE TYPE CODE (where applicable): OBJC

PACKAGE NUMBER:

PROBLEM STATEMENT:

A Scope of Collections needs to be prepared to establish the parameters of what would be accepted in the collections, to identify needs for possible additions to complete or round out the Rainbow Bridge museum collection, carry out consultation with Native American groups concerning collection contents, and address collection items that are not relevant to the monument and their disposition.

DESCRIPTION OF ACTION:

1) Recommended Action:

A professionally researched and written Scope of Collections will be completed by a qualified curator who will write the document. It is probable that the need for acquisition of historic ethnographic documents, files and historic photographs will be identified.

The project will be completed within one year.

Other related projects include: RABR C 004

Project responsibility will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 7.4 B(2)

Proposal Date: 90

PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	ADM	7.5	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-006

TITLE: PREPARE AN ADMINISTRATIVE
HISTORY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C08

CULTURAL RESOURCE TYPE CODE (where applicable):

PACKAGE NUMBER:

PROBLEM STATEMENT:

No single administrative document is available that summarizes and synthesizes the years of NPS management at Rainbow Bridge since 1916. NPS-28 recommends an administrative history for each area. An administrative history is needed that will document the formation of the monument, an event about which little is known at the present time.

DESCRIPTION OF ACTION:

1) Recommended Action:

A professionally researched and written administrative history will be undertaken. This history should describe the establishment of the monument, management policies, designation programs, relationships, consultations and agreements with Native Americans, and development and use of facilities. The history should also address the management of the monument from its establishment in 1910 to 1916, when NPS was created and assumed management responsibilities.

The project should be completed within a one year period.

Other related projects include: RABR-C-002

Project responsibility will be assigned to the Branch of Cultural Resources, who will coordinate and oversee its completion.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

Proposal Date: 90

RABR-C-006

PROJECT STATEMENT SHEET

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	15.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-007

TITLE: CONDUCT ROCK ART-HISTORIC INSCRIPTION INVENTORY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C02

CULTURAL RESOURCE TYPE CODE (where applicable): SITE

PACKAGE NUMBER:

PROBLEM STATEMENT:

The rock art and historic inscriptions found on the rock faces around Rainbow Bridge contain a legacy of long use of the area by prehistoric and historic visitors. The known prehistoric rock art and many of the historic inscriptions have been documented; however, a complete inventory is needed. This work will be necessary before graffiti removal on adjacent rock surfaces can be accomplished.

DESCRIPTION OF ACTION:

1) Recommended Action:

A complete inventory of prehistoric rock art and historic inscriptions around the base of the bridge will be completed. This work will include thorough documentation, including the preparation of detailed point-provenience maps of all panels containing inscriptions thought to be of historic importance. Archival-quality photodocumentation and sketches of each of the identified panels will also be completed. Panels of questionable origin or significance should be researched using historic and ethnographic information.

This project may result in important information regarding early visitors to the bridge, and will also serve as baseline data for the graffiti removal action plan.

The project will be completed within a one-year period.

Other related projects include: RABR C 001

Project responsibility will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

Proposal Date: 90

PROJECT STATEMENT SHEET

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App.2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	10.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-008

TITLE: PREPARE ETHNOGRAPHIC
OVERVIEW & ASSESSMENT

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C04

CULTURAL RESOURCE TYPE CODE (where applicable): ETHN

PACKAGE NUMBER:

PROBLEM STATEMENT:

An ethnographic overview and assessment is needed to outline research issues to be addressed in a subsequent ethnographic study.

The Rainbow Bridge area has been occupied by various Native American groups for many centuries. The bridge itself has religious significance for Navajos, and the surrounding area may have been used in other ways as well. Paiutes, now largely subsumed within the Navajo population, also inhabit the area. In addition, early Euro-American visitors noted a shrine at the base of the bridge that may have been of prehistoric or historic Pueblo affiliation.

One of the NPS objectives in managing the use of the bridge is allowing for visitation by boaters and hikers, in a way that is compatible with Native American concerns and needs.

DESCRIPTION OF ACTION:

1) Recommended Action:

An ethnographic overview and assessment will be completed to provide direction to an ethnographic study. The work will primarily involve conducting background research on previous published documents and archival materials. A professionally written, detailed report will be prepared that summarizes past and present uses of the area by Native American groups. This information will guide fieldwork during the ethnographic study.

The project will be completed within a one-year period.

Other related projects include: RABR-C-003, RABR-C-009.

Proposal Date: 90

PROJECT STATEMENT SHEET

Project responsibility will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL OTHER

EXPLANATION: 516 DM2 App.2, 1.6. AIRFA consultat

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	15.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-009

TITLE: PRESERVE CULTURAL LANDSCAPE

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: CULT LAND REPT CULT LANDSCAPE

CULTURAL RESOURCE TYPE CODE (where applicable): CULL

PACKAGE NUMBER:

PROBLEM STATEMENT:

The cultural landscape is of a particular type called an ethnographic landscape. As it presently exists, this landscape is an important, but fragile, aspect of the monument. This landscape needs to be preserved.

The condition of the ethnographic landscape is unknown, because what constitutes the entire ethnographic landscape is yet to be determined. However, impacts known to have occurred since the establishment of the monument include the inundation of the stream below the bridge by Lake Powell, and the construction of docks and walkways. These impacts are considered severe to moderate. Identification of the landscape, detailed documentation of its present condition, and the identification of condition trends is needed to manage the landscape and protect it from further degradation.

DESCRIPTION OF ACTION:

1) Recommended Action:

A document will be prepared that describes the ethnographic landscape, as is, with the goal of preventing additional deterioration. The study should attempt to determine the appearance of the bridge landscape at selected dates in the past, through the use of archival materials (documents and photographs), interviews with earlier visitors regarding their attitudes and aesthetic perceptions of the bridge, and possibly other means. This information will be used to identify trends in condition changes over time, and will guide future management decisions in the monument.

This project will be completed within a one-year period.

Other related projects include: RABR-C-003,

Proposal Date: 90

PROJECT STATEMENT SHEET

RABR-C-008; these two projects should be completed before RABR-C-009 begins.

Project responsiblity will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 7.4 B(2)

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CRPP	RES	10.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-010

TITLE: MONITOR CULTURAL RESOURCES

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C19

CULTURAL RESOURCE TYPE CODE (where applicable): SITE

PACKAGE NUMBER:

PROBLEM STATEMENT:

Several significant archeological sites are located in the monument. On-going high visitation is endangering these fragile sites. A regular monitoring program is needed to identify specific impacts, which may result in further management actions to protect, or mitigate impacts, if necessary for these important resources. A monitoring program would provide early warning to deter and detect ARPA violations.

Although no substantial architectural sites are located in the monument, some sites have potential for significant subsurface cultural materials. This potential is especially apparent in dry shelters within the Navajo Sandstone, where well-preserved, perishable remains may be located.

No detailed baseline information beyond initial site documentation (1985) is available for archeologial sites in the monument. However, based on on-going monitoring observations in Glen Canyon NRA, the level of impacts to sites tends to be proportional to the degree of visitation. Therefore, impacts to cultural resources located near Rainbow Bridge are likely. A monitoring program is needed to provide data for making subsequent management decisions regarding the preservation of these sites.

DESCRIPTION OF ACTION:

1) Recommended Action:

An on-going monitoring program will be developed and instituted in the monument. Methodologies currently in place in Glen Canyon NRA will be applied to Rainbow Bridge as well. This work will include documenting detailed site conditions, with extensive written records, maps and archival quality photographs.

PROJECT STATEMENT SHEET

Follow-up monitoring will take place on a periodic basis, with the goal of identifying subsequent condition changes. This information will provide NPS with data sufficient for taking necessary actions to preserve these resources.

This project will be on-going, with baseline documentation occurring during FY1, and follow-up monitoring occurring on a periodic basis as considered necessary.

Project responsibilily will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF7	MON	10.0	0.4

Year 2:	Source	Act Type	Budget($1000)	FTE
	CF1	MON	4.0	0.2

Year 3:	Source	Act Type	Budget($1000)	FTE
	CF1	MON	5.0	0.2

Year 4:	Source	Act Type	Budget($1000)	FTE
	CF1	MON	5.0	0.2

Proposal Date: 90

PROJECT STATEMENT SHEET

PROJECT NUMBER: RABR-C-011

TITLE: CONDUCT ARCHEOLOGICAL
INVENTORY

FUNDING STATUS: UNFUNDED

SERVICEWIDE ISSUE CODES: C02

CULTURAL RESOURCE TYPE CODE (where applicable): SITE

PACKAGE NUMBER:

PROBLEM STATEMENT:

A previous survey of the monument covered all but 60 acres of slickrock above the canyon rim. Additional survey is needed to provide complete coverage. At low lake level, a survey should be accomplished to determine if receding water exposes unrecorded sites.

DESCRIPTION OF ACTION:

1) Recommended Action:

An intensive, systematic pedestrian survey will be conducted on the slickrock areas above the canyon rim. Located archeological and/or historic sites will be fully documented. Documentation will include the completion of IMACS site forms, sketch maps, photographs, map plots on topographic quadrangles and/or aerial photos, and other information where necessary. A professionally written descriptive report will be prepared for NPS use as a research and management- oriented document.

A National Register evaluation will be conducted, and if warranted, nominations will be prepared and submitted.

This project will be completed within a one-year period.

Related projects include: RABR C 010

Project responsibility will be assigned to the Branch of Cultural Resources.

2) Alternative Actions and Impacts: N/A

Proposal Date: 90

RABR-C-011

PROJECT STATEMENT SHEET

COMPLIANCE CODE(s): EXCL

EXPLANATION: 516 DM2 App. 2, 1.6

BUDGET AND FTE's:

Year 1:	Source	Act Type	Budget($1000)	FTE
	CF5	RES	10.0	

Year 2:	Source	Act Type	Budget($1000)	FTE

Year 3:	Source	Act Type	Budget($1000)	FTE

Year 4:	Source	Act Type	Budget($1000)	FTE

Proposal Date: 90

VI. APPENDICES

- Tables 1 & 2
- Cultural Resource Documentation Checklist
- Cultural Resource Status Summary Charts
  - Archeological sites
  - Objects
  - Cultural landscapes

FY: 90
PARK: RABR
Region: RMR

TABLE 1
NPS RESOURCE PERSONNEL
(current year only)

TYPE OF NPS EMPLOYEE	FTEs OF RESOURCES WORK		
	Natural	Cultural	Total
Research Scientists			
Resources Specialists			
025 Park Rangers Res Mgmt			
025 Park Rangers Res Pro	0.2		0.2
025 Park Rangers Res Int	0.3		0.3
Maintenance Personnel	0.1		0.1
Total of RES Personnel	0.6		0.6
TOTAL PARK FTE: 3.4 PERCENT	17.6		17.6

TABLE 2
CURRENT YEAR NATURAL AND CULTURAL RESOURCES FUNDING
($ in thousands - funding by activity type)

FY: 90
PARK: RABR
REGION: RMR

FUNDING SOURCE	TOTAL	RESEARCH DOCUMENTATION	MITIGATION / TREATMENT	MONITORING	PROTECTION	INTERPRETATION	PROGRAM ADMIN / TRAINING
NRNON NPS	2.0			2.0			
PKNR-OTH	11.5		2.5		3.0	6.0	
ALL SOURCES	13.5		2.5	2.0	3.0	6.0	

CULTURAL RESOURCE DOCUMENTATION CHECKLIST

Place an X in the appropriate column. Leave columns blank if document is not required for the park. Remember that items in the first section, PLANNING DOCUMENTS, may also apply to natural resources. See NPS-28, Chapter 2 for description of each inventory or study.

TITLE	CURRENT AND APPROVED	INCOMPLETE; NEEDS REVISION OR UPDATING	NEEDED
PLANNING DOCUMENTS			
Preauthorization and Authorization	X		
Statement for Management (SFM)		X	
Outline of Planning Requirements (OPR)	X		
General Management Plan (GMP)	X		
Development Concept Plan (DCP)	X		
Resources Management Plan (RMP)	X		
Interpretive Prospectus (IP)	X		
SERVICEWIDE INVENTORIES, LISTS, CATALOGS, AND REGISTERS			
Cultural Resources Bibliography (CRBIB)			X
Cultural Sites Inventory (CSI)		X	
List of Classified Structures (LCS)	N/A		
National Catalog of Museum Objects		X	
National Register of Historic Places		X	
BASIC CULTURAL RESOURCE DOCUMENTS			
Archeological Overview and Assessment	X		
Archeological Identification Studies		X	
Archeological Evaluation Studies	X		

CULTURAL RESOURCE DOCUMENTATION CHECKLIST

TITLE	CURRENT AND APPROVED	INCOMPLETE; NEEDS REVISION OR UPDATING	NEEDED
BASIC CULTURAL RESOURCE DOCUMENTS (cont.)			
Ethnographic Overview & Assessment			X
Ethnographic Oral Histories & Life Histories			X
Ethnographic Program			X
Historical Base Map		X	
Historic Resource Study (HRS)			
Park Administrative History			X
Scope of Collection Statement			X
SPECIAL RESOURCE STUDIES AND PLANS			
Archeological & Ethno. Collections Studies			X
Archeological Data Recovery Studies	N/A		
Collection Management Plan			X
Collection Storage Plan			X
Collection Condition Survey			X
Cultural Landscape Report (CLR)			X
Ethnohistory			X
Exhibit Plan	N/A		
Historic Furnishings Report	N/A		
Historic Structure Preservation Guide (HSPG)	N/A		
Historic Structure Report	N/A		
Social Impact Study			X
Special History Study			X
Traditional Use Study			X

SUMMARY CHART FOR ARCHEOLOGICAL SITES

Significance		Condition					Impacts				Documentation		
		Good	Fair	Poor	Destroyed	Unknown	Severe	Moderate	Low	Unknown	Good	Fair	Poor
National													
State & Regional													
Local													
Not Evaluated	8	4	3	1			1	4	3			8	
TOTALS	8	4	3	1			1	4	3			8	

SUMMARY CHART FOR OBJECTS

DOCUMENTATION Form 10-254 Submitted to National Catalog at Harper's Ferry	Archeology	Ethnology	History	Archives	Biology	Paleontology	Geology	TOTALS
Registration Data Only			0					
Registration & Catalog Data			14					
Total Items Cataloged			14					
Backlog to be Cataloged			* 1,000 estimate					
Total Collection Summary			1,014					

* photographs

CONDITION The percentage of collection in the following categories	Archeology	Ethnology	History	Archives	Biology	Paleontology	Geology
Excellent			6				
Good			6				
Fair			2				
Poor			0				
Unknown			1,000				

SUMMARY CHART FOR CULTURAL LANDSCAPES

Significance		Condition				Impacts				Documentation		
		Good	Fair	Poor	Unknown	Severe	Moderate	Low	Unknown	Good	Fair	Poor
National												
State & Regional												
Local												
Not Evaluated	1				1	Estimated severe to moderate.			1			1
TOTALS	1				1				1			1

APPENDIX D

FLASH FLOOD MITIGATION PLAN

FLASH FLOOD MITIGATION
RAINBOW BRIDGE NATIONAL MONUMENT

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PURPOSE OF FLASH FLOOD MITIGATION PLAN

INTRODUCTION

National Park Service (NPS) guidelines define "flash flood" as one in which the flood waters rise so rapidly that there is insufficient time for warning and evacuation of persons threatened by the flood. NPS guidelines classify such flash-flood areas as high hazard areas and require that specific management actions be taken to reduce the flood hazard. Thus, when studies reveal that existing structures or facilities are subject to the effects of flash flooding, as they are at Rainbow Bridge, a plan of action for flood mitigation is to be prepared. The following pages contain the National Park Service's Flood Mitigation Plan for Rainbow Bridge National Monument.

BACKGROUND

Flood mitigation methods were developed within NPS guidelines for compliance with Executive Order 11988 (Floodplain Management). Executive Order 11988 was developed "in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative," (E.O. 11988; 42 F 26951). Consistent with these guidelines, the National Park Service has developed the following objectives (listed in priority order) for floodplain management at Rainbow Bridge: protect life, allow existing visitor use areas to remain open to the public wherever possible, and protect property.

NPS guidelines specify protection against the probable maximum flood (PMF) within flash-flood hazard areas. This mitigation plan defines the probable maximum floodplain and 100-year floodplain. The 100-year flood is a flood that can be expected to be equaled or exceeded on average once every one hundred years. Floods of this magnitude occur frequently enough to pose a serious threat to all facilities and people. The PMF is the largest flood that can ever be expected to occur in an area; however, these floods are rare, and their statistical probability of occurring is uncertain. Estimates for the 100- and 500-year floods can be calculated to be about 8 and 10 feet, respectively, above the existing channel bottom in this area. No PMF is recorded for the area. Existing trails are located outside the area of 100- and 500-year floods. Actual delineation of the PMF will be done at the time of plan implementation. PMF limits will be used to set signing and provide visual information for a wayside exhibit. Larger flash floods have occurred on occasion; for example, in 1974 at Eldorado Canyon on Lake Mohave (nearby in Lake Mead National Recreation Area) a flood occurred that was 7.6 times larger than the calculated 100-year flood and two-thirds of the calculated PMF.

FLOOD MITIGATION ALTERNATIVES

INTRODUCTION

During preparation of the flood mitigation plan, considerable discussion occurred on the level (100-year versus probable maximum) and type (structural versus nonstructural) of flood mitigation that should be provided for those areas subject to flash-flood hazard. The plan evaluated both structural and nonstructural flood mitigation alternatives.

STRUCTURAL MITIGATION ALTERNATIVES

Structures like dikes, levees, and channels can be designed and built to control floods. They are very expensive, but achieve the greatest level of protection for floods up to the size they were designed to protect against. Structures are susceptible to failure, and great care must go into their design and construction. The consequences of a failure can be catastrophic since they usually are not anticipated or prepared for in advance. In addition, any structural mitigation measures undertaken at Rainbow Bridge would create a major visual intrusion and interfere with the monument's natural beauty. Measures could also involve construction of structures on Navajo lands, which would need to be coordinated with the Navajo Tribe.

NONSTRUCTURAL MITIGATION ALTERNATIVES

The more traditional flood mitigation measures are structural, such as dams, dikes, levees, and channels. In addition to these structural mitigation measures are nonstructural measures that can be applied whether structural measures are used or not.

Relocation

Relocation of threatened facilities out of flood hazard areas is the most effective nonstructural strategy. It eliminates the flood hazard for people and property, but it is very expensive. The following three methods only mitigate the hazard for people in the floodplain; property remains susceptible to damage.

Information/Education

Information/education can make people aware of a flood hazard and provide them information about coping with the threat. These activities include erecting warning signs, posting notices, distributing pamphlets, presenting information at public meetings, and distributing flood hazard area maps. Education and information activities are applicable nonstructural measures at all developed areas having a flood hazard, regardless of other measures that might be considered or implemented, excepting total relocation.

Flood Warning Systems

Flood warning systems can give people notice of an impending flood so that they protect themselves, and if time permits, their property. These systems include elements that deal with provisions for early identification of an impending flood; analysis of the magnitude, severity, and potential impact of an impending flood; and dissemination of appropriate warnings to parties likely to be affected by an impending flood.

Evacuation Planning and Emergency Preparedness

Evacuation planning and emergency preparedness consists of arrangements for evacuation of endangered areas when a flood is anticipated and other emergency preparedness actions. These arrangements consist of assignments of responsibility for various actions, provision of transportation or other assistance to evacuees, traffic control, and opening and operation of shelters to provide refuge in flood-safe areas. Once an evacuation plan has been proposed for an area, all NPS employees will be trained on what to do in a flood emergency. Evacuation planning for Rainbow Bridge is influenced by two factors. First, flooding can occur very quickly; therefore, people must respond rapidly to a warning to save their lives. Second, the facilities are located such that safe refuge is close at hand, but some are difficult to reach because of steep slopes.

ALTERNATIVES CONSIDERED, BUT REJECTED

Relocation of monument dock facilities to a place other than those shown in the alternatives is not feasible. Visitors could be stopped on the floating walkway some distance from Rainbow Bridge, but the visitor experience would be greatly diminished. All land access would have to be prohibited, or to avoid flood hazard, the floating platform would have to be several hundred yards from Rainbow Bridge, practically back to the existing courtesy docks. Due to the constricted lake channel in this area, a large floating platform for visitors to congregate on at the northwest end of the walkway would not be feasible. This facility arrangement is unacceptable if a meaningful visitor experience is to be maintained.

Structural flood mitigation measures such as dams, dikes, levees, and channels were not considered. Their impact on the monument was determined to be excessive. Such structures would directly contradict and degrade the purposes for which the national monument was established.

Another option for predicting flash-flood hazard is radar. However, there is not an adequate radar system in the area to provide such precise small drainage warning. If one were installed on Navajo Mountain, it would have the added benefit of providing flash flood warning capabilities for most of Glen Canyon National Recreation Area and surrounding areas. However, the cost of installing, maintaining, and monitoring such a system makes this option prohibitive.

CONCLUSION

Effectiveness of various flood mitigation measures varies widely. If the goal of the flood mitigation measures is to protect property, only structural mitigation and relocation are effective. However, if the goal is to protect people, the nonstructural mitigation measures offer relatively inexpensive alternatives.

The nonstructural measures are usually applied together and can result in successful evacuation. However, there are often people who refuse to leave their vehicles or obey the orders or warnings to evacuate. There may be elderly or disabled people who cannot respond quickly, and there is the possibility that some people won't receive the message to evacuate. Also, there can be failures in the flood warning system. They usually rely on devices in remote locations that sense rainfall or flood water levels and transmit their information by radio communications to a computer, radio dispatcher, or warning device that is automatically activated. The sensing devices and the radio communication systems must be maintained and in working order, and the radio communication systems must continue working through an electrical storm. The probability of a warning system failure cannot be estimated, but that possibility must be considered. Therefore, even if the last three nonstructural mitigation strategies are applied together, there may still be flood victims. The goal is to greatly reduce the number of victims, and the hope is that there will be none.

RAINBOW BRIDGE FLOOD MITIGATION PLAN

INTRODUCTION

There are four components of the Flash Flood Mitigation Plan--a wayside exhibit, additional signing, evacuation and emergency preparedness procedures and a warning system.

WAYSIDE EXHIBIT

Information can be provided that would greatly reduce the flash-flood hazard to visitors. An eye-catching wayside can be placed where everyone would walk by it. Per NPS regulations related to floodplain management, the wayside would show flood hazard areas and illustrate the flood of record (if known), 100-year flood, and probable maximum flood. This would be shown with a plan-view map of the area, showing flood hazard areas, safe areas to move to in case of a flood, and a cross-section diagram of Rainbow Bridge and the canyon under it, showing the various flood levels. Text would explain the hazard and what to do in case of a flash flood.

ADDITIONAL SIGNING

Signs telling visitors in the flood hazard zones where to move in case of a flood would be added. Any section of trail on land in the flood zone should have signs posted that simply read "Climb to Safety in Case of Flood" and show a diagram of a person ascending a steep slope. On the walkway that is in the flood hazard zone, signs should read "Return to Boats in Case of Flood and Leave Area."

EVACUATION AND EMERGENCY PREPAREDNESS PROCEDURES

Evacuation and emergency preparedness measures would be identified for the monument. A chain of command outlining who is responsible for what actions must be identified. Emergency supplies would be stored at Dangling Rope and Rainbow Bridge. Supplies needed, their exact locations, and any necessary support facilities would be identified.

WARNING SYSTEM

Although warning systems are expensive to maintain, the ability to give adequate warning for evacuation of the few areas affected by flash flood is important. Under the plan, a warning system that provides at least six minutes advance warning would be installed. Given this time, visitors could be expected to be evacuated to areas of safety. Visitors would be alerted to evacuate by sirens and flashing lights at the dock and appropriate signing and land trails within the monument. Ranger assistance would help insure an expedient evacuation and greater assurance of success.

System Design

Two gauges would be located in the middle of the Bridge Canyon/Rosebud Creek Channel, one to two miles upstream. The location of the triggering mechanism needs to be placed sufficiently upstream to provide an acceptable warning time. The exact distance and warning time required will be provided to design engineers during system design by Fort Collins Water Resources Division and safety officials. The system would be equipped with photovoltaic panels to charge batteries for a radio transmitter. All would be accessible by trail, and construction and maintenance would be restricted by horseback or foot access. Actual design for the system would be done during the advanced planning stage for plan implementation and may include modeling of docking facilities from the impact of wave action generated by flash floods at various intervals. The assessment from this modeling will be used in displays in the wayside exhibit.

The most limiting flood depth for warning of an impending flash flood may be the 100-year flood or a smaller recurrence interval event. The appropriate criteria will be set at the time of system design by Fort Collins Water Resource Division and safety officials. At a minimum, the actual depth of a 100-year flood could be used and can be reasonably estimated for this area. Using equations presented in a U.S. Geologic Survey report (*Thomas and Lindskov, 1983*) for estimating depth of flow gathered for distinct climatic areas of the State of Utah (D100 = 17.9* [A0.143]* [E-0.680]), the estimated depth of flow above the bottom of the stream channel for a 100-year flood is 7.5 feet where

D100 = 100-year recurrence interval flood depth
A = watershed area in square miles
E = average watershed elevation in thousands of feet.

The watershed for Bridge Creek was measured at 6.92 square miles and 5,500 feet, respectively (memo and personal conversation, Smillie, 8/89).

The stream flow gauge system would transmit a signal when a certain flow level was reached. The transmitter would signal a repeater on Navajo Mountain that in turn would signal a siren/flasher system at Rainbow Bridge and at Glen Canyon NRA dispatch. The flow level would be calculated based on modeling done at the time of plan implementation. Each gauge would be activated when the water height exceeded the calculated elevation. Gauges would be attached to a power source and transmitter. The power source would probably be batteries attached to photovoltaic panels for charging.

Coordination with the Navajo

In all probability, placement of the stream flow gauge would be on the Navajo Reservation in both the Bridge Creek and Redbud drainages. The National Park Service will coordinate location of the stream flow gauge at the time of system design.

Maintenance and Testing

In order to be fully successful, this system needs to incorporate a regular manual testing and maintenance program. This would be designed to insure a fully working system and avoid the false sense of security by staff that the monument is protected, which could come about when a system of this type is put into place. *The importance of this component of the program cannot be understated. Cyclic maintenance is a necessity and should be viewed as the highest priority.* Recurring costs in the form of operations and maintenance from this would be about $5,000 annually.

COST

The signs and wayside would cost approximately $4,500. However, if the wayside is added on a separate floating walkway structure so the walkway is wider at that location, an additional $9,000 will be required for the floating walkway section.

The stream gauge system would cost approximately $40,000 to $70,000.

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▨ **approximate flash flood area**

100–year flash flood area is 8' above channel bottom, 500–year flash flood area is 10' above channel bottom.

0 200 400 600 feet

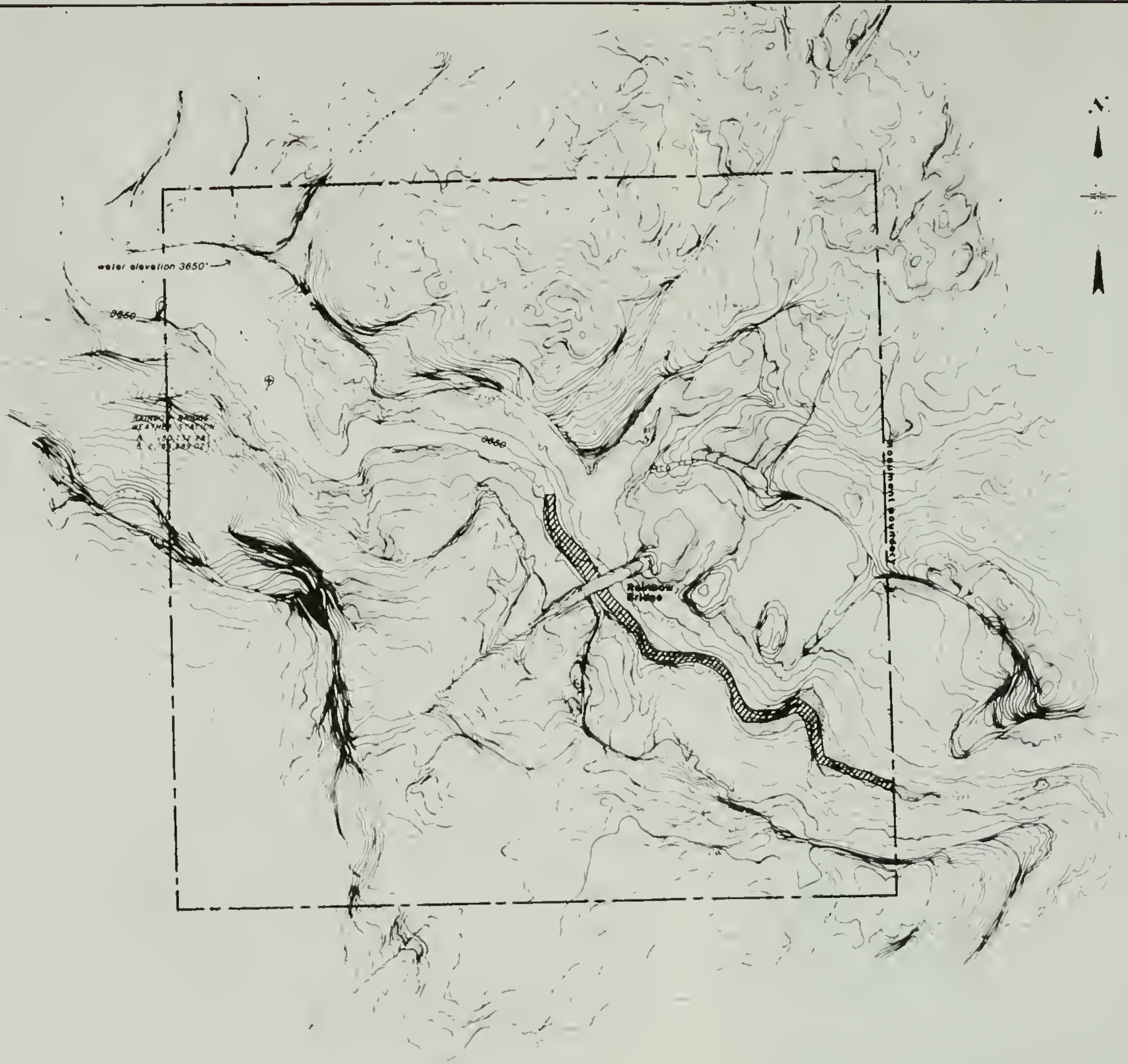
contour interval 5'

Flash Flood Area

Rainbow Bridge National Monument

United States Department of the Interior - National Park Service

118 | 80,019
June 90 | RMRO



▨ **approximate flash flood area**

100-year flash flood area is 8' above channel bottom, 500-year flash flood area is 10' above channel bottom.

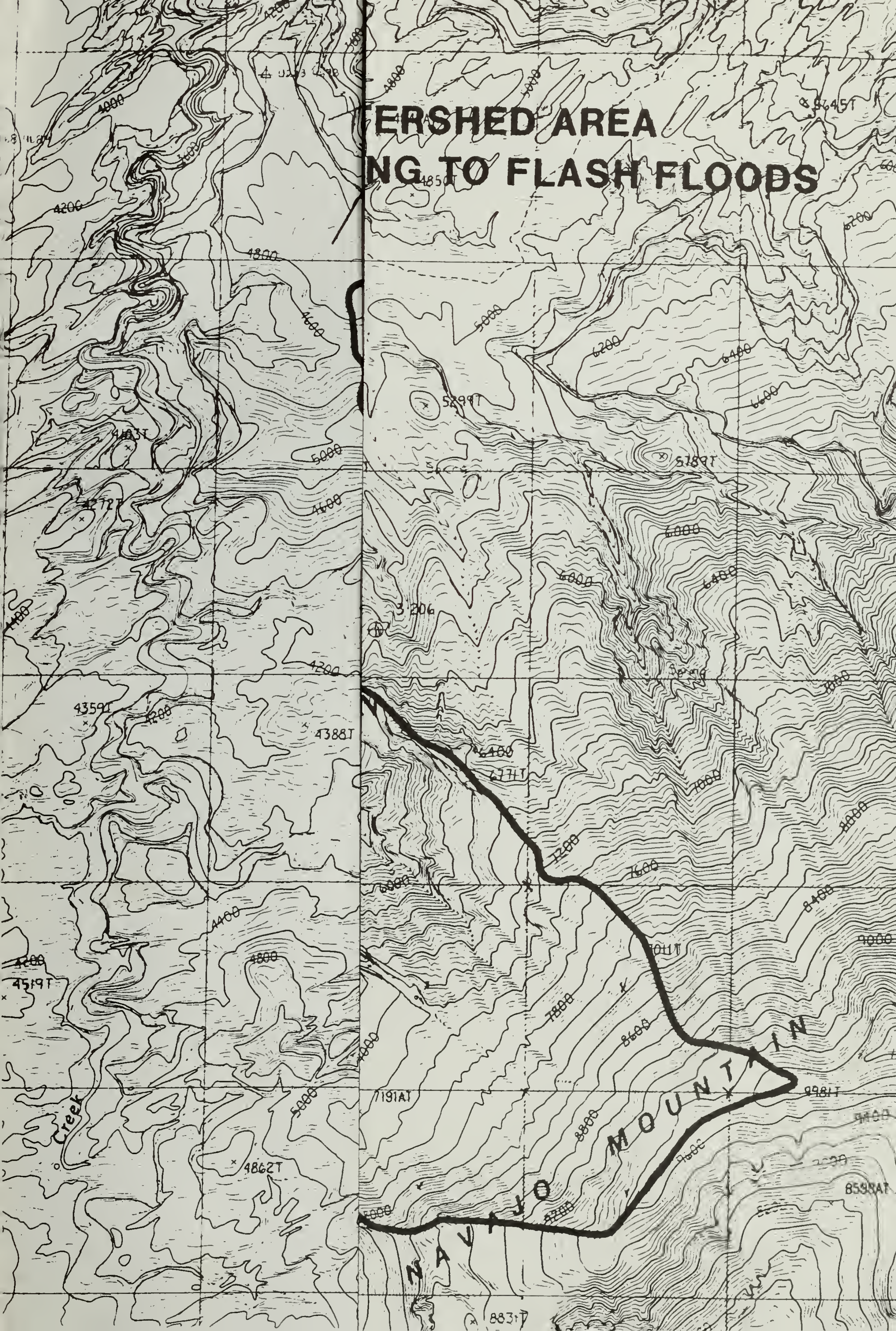
0 200 400 600 feet
contour interval 5'

Flash Flood Area

Rainbow Bridge National Monument

United States Department of the Interior – National Park Service

118|80,019
June 90|RMRO



ERSHED AREA
NG TO FLASH FLOODS
NAVAJO MOUNTAIN
Creek
Spring
4850T
5299T
5189T
4183T
4272T
4359T
4388T
6771T
7011T
7191AT
4519T
4862T
8981T
8598AT
8831T
3 206
4000
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8400
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8800
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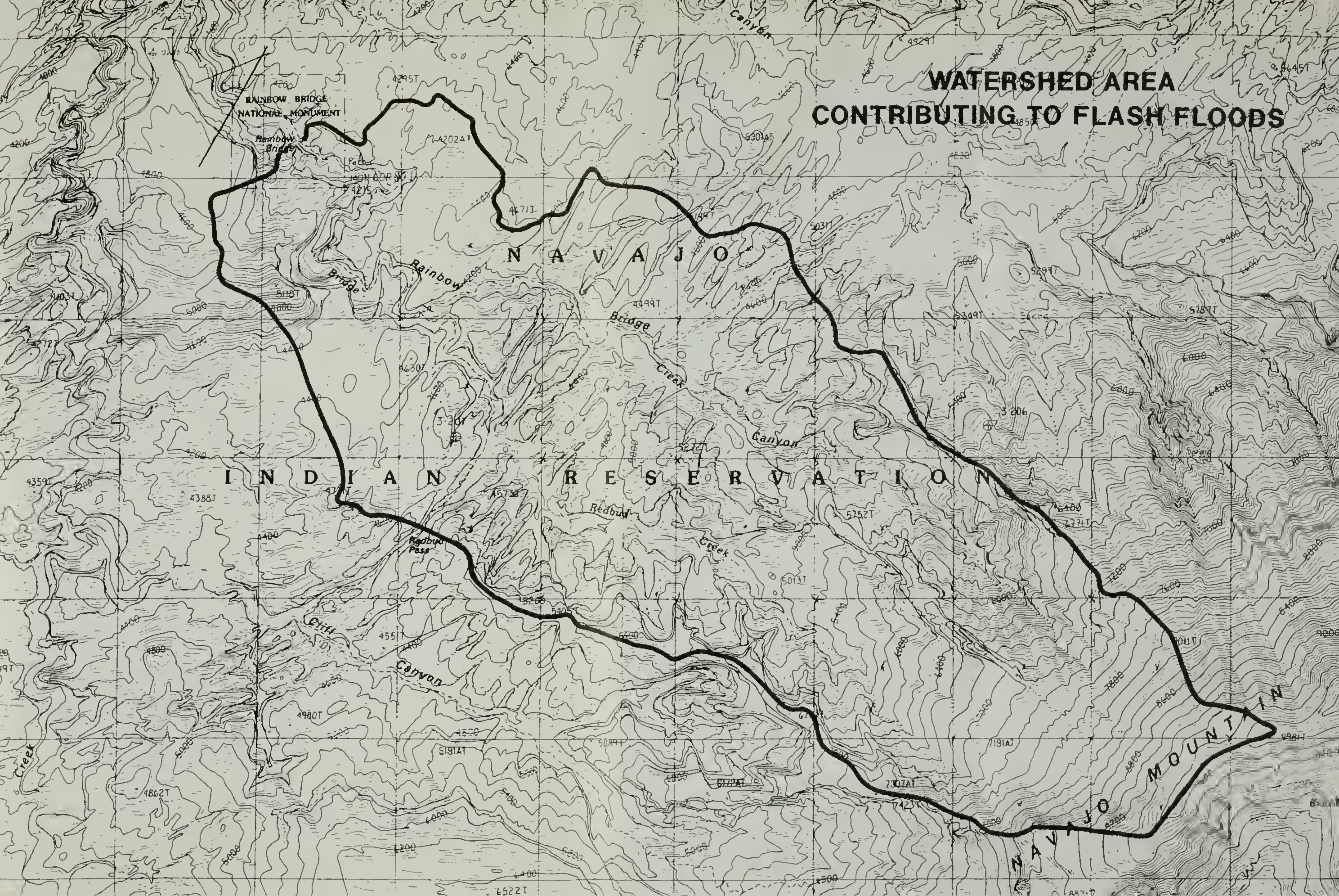

WATERSHED AREA CONTRIBUTING TO FLASH FLOODS

NPS D-132